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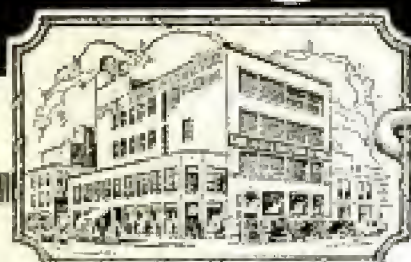
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SEE PAGE 177

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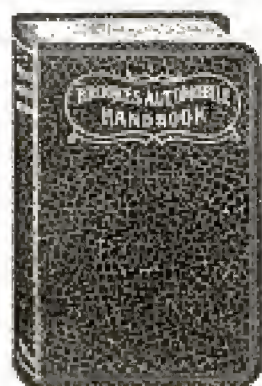
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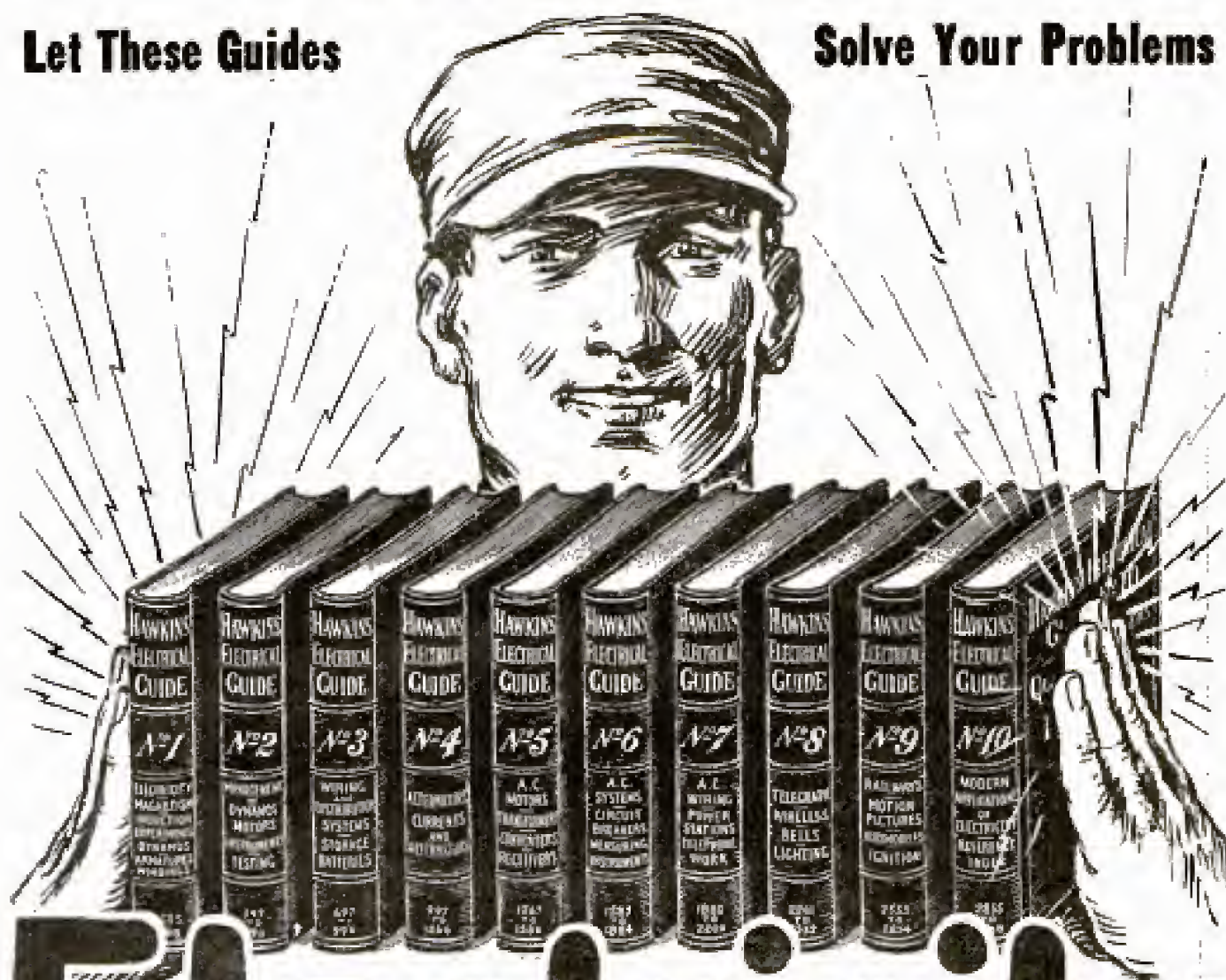
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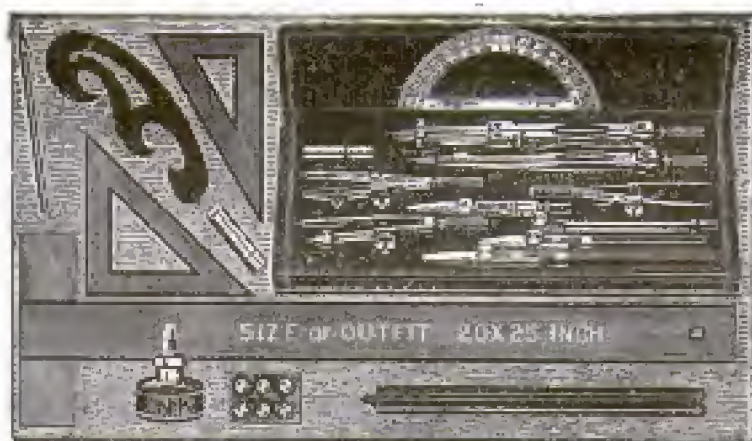


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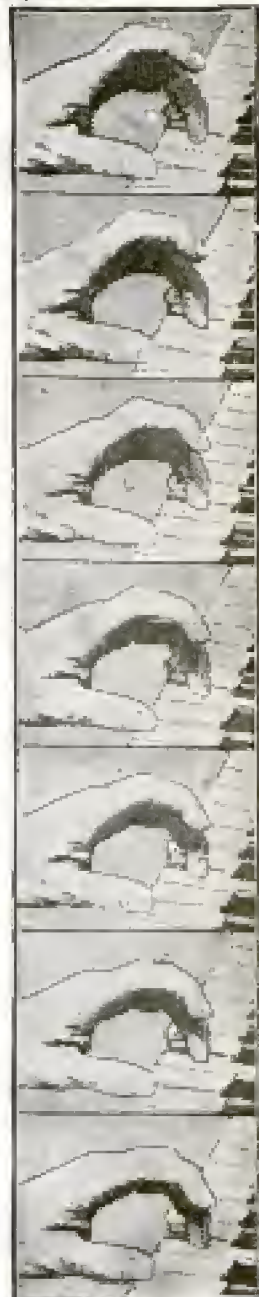
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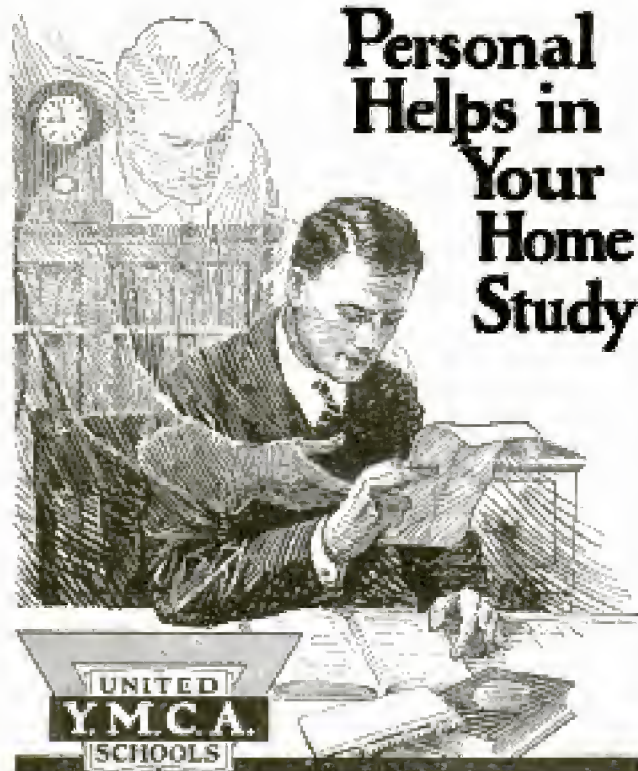
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 Please submit me for Free Examination, Au-del's Engineers' and Mechanics' Guides. If satisfactory I agree to pay you \$1 a month until \$10 is paid.
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Address _____



At thirty-three he was the head of a promising little business of his own

At thirty-five he was back again at a job; a cog in a big machine



Will you be one of the 38.2%?

FIVE years ago a man of thirty took his savings, and the savings of some of his friends, and embarked in business for himself. He was honest, industrious and attractive; there seemed to be every reason why he should succeed.

To-day, at thirty-five, he is filling a departmental position in a big concern—a position no better than the one he left five years ago.

What happened to his business that promised so much? Fraud? No. Lack of capital? Not primarily. Neglect? Not at all.

The trouble was with the training of the man. He was an expert salesman but he knew absolutely nothing of the other phases of business.

The failures the Institute could prevent

HE could sell goods, but he was wholly ignorant of factory and office organization and control. Costs and accounting were a foreign language to him; transportation, advertising, corporation finance—he made mistakes in every one of them, and each mistake cost him money.

He belonged to the 38.2% of business failures whom Bradstreet groups under the tragic head: "Incompetence."

It is these failures—and those due from "inexperience" and lack of capital (which is merely another word for bad judgment) that the Alexander Hamilton Institute can prevent.

For its Modern Business Course and Service is designed to round out a man; not to make him a better specialist in the single department he already knows, but to give him a working knowledge of all other departments.

That is why so large a proportion of the thousands of Institute men have stepped from mere positions into busi-

Here are the Reasons Why Men Fail

as reported by Bradstreet

Cause	Percentage
*Incompetence	38.2%
*Inexperience	5.4
*Lack of capital	39.3
*Unwise credits	1.3
*Fraud	7.0
*Failures of others	1.7
Extravagance	1.1
Neglect	1.7
Competition	1.1
Specific conditions	11.3
Speculation	.7
Total	100.0%

*These are the needless failures that a well-rounded business training would prevent.

Lack of training in the fundamentals which underlie all business makes men incompetent; leaves them ignorant of the experience of others; races them as poor risks for capital; blinds them to the ordinary safeguards of credit extension; and exposes them to all the frauds which prey on business ignorance.

nesses of their own, and have achieved unusual success.

Will you work all your life in a routine job?

YOU may never have thought of it in this way but you are paying for the training of the Alexander Hamilton Institute whether you accept it or not.

If you do accept it, the cost is a little investment in money and time. But who can figure what the cost of indecision and delay may be?

Suppose tomorrow an opportunity comes in your present organization for a trained and self-confident man to step up

into the class of executives? Or suppose some day you, with your savings and experience, start a business of your own.

Most men look forward to such a day—the day they will be made executives or go into business for themselves. It is the beginning of real independence. Will you be equipped when that day comes?

"Forging Ahead in Business"

THE Institute has helped thousands of men to shorten their path to independence. It makes no special argument; it asks only for an opportunity to lay the full facts before thoughtful men for their consideration and decision. The facts are gathered into a book of 120 pages entitled "Forging Ahead in Business."

It explains the Modern Business Course and Service in full, and tells just what it has done for other men in positions similar to yours. Any thoughtful man may have a copy on request, and without obligation. For your convenience we attach a coupon, and suggest that you fill it in now.

Alexander Hamilton Institute
374 Astor Place, New York City



Send me "Forging Ahead in Business" which I may keep without obligation.

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Business Address.....

Business Position.....

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Let the I. C. S. help *you*, too. Choose the work you like best in the coupon below, then mark and mail it today. This doesn't obligate you in the least, and it will bring you the full story of what the I. C. S. can do for you.

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Without cost or obligation, please send me complete information about the subject before which I have placed an X in the list below:

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| <input type="checkbox"/> DRAFTING | <input type="checkbox"/> Salesmanship |
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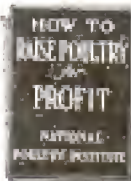
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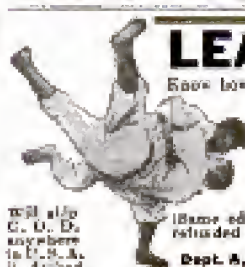
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An Amazingly Easy Way to Earn \$10,000 a Year

Let Me Show You How FREE

TO the average man the \$10,000 a year job is only a dream. Yet today there are a surprising number of men earning five figure salaries who were merely dreaming of them a short while ago. The secret of their success should prove a startling revelation to every ambitious man who has ever aspired to get into the \$10,000-a-year class.

There is nothing "different" about the man whose salary runs into five figures. He is made of the same stuff as you and I. For example, take J. P. Overstreet, of Dallas, Texas. A few short years ago he was a police officer earning less than \$1,000 a year. Today his earnings are in excess of \$1,000 a month—more than \$12,000 a year. C. W. Campbell, Greensburg, Pa., was formerly a railroad employee on a small salary—last month his earnings were \$1,562.

Why Don't YOU Get into the Selling Field?

Read These Amazing Stories of Success

Earned \$524 in Two Weeks

I had never earned more than \$50 a month. Last week I cleared \$524 and this week \$215. You have done wonders for me. Geo. W. Kearns, 107 W. Park Place, Oklahoma City, Okla.

Now Earn as High as \$100 a Day

I took your course two years ago. Was earning \$15 a week doing. Am now selling most of the largest firms in the U. S. I have earned more than \$100 a day. You secured me my position. Our Sales Manager is a graduate of yours. J. L. DeBevoise, 1615 Warsaw Avenue, Chicago, Ill.

Earned \$1,562 in Thirty Days

My earnings for the last thirty days are \$1,562.00 and I was Second Prize in March although I only worked two weeks during that month.—C. W. Campbell, Greensburg, Pa.

Earned \$1,800 in Six Weeks

My earnings for March were over \$1,000 and over \$1,800 for the last six weeks, while last week my earnings were \$300.00. I travel eleven months out of the year, working 4 days each week. The N. S. T. A. dug me out of a rut where I was earning less than \$1,000 a year and showed me how to make a success.—J. P. Overstreet, Dallas, Texas.

Mr. Overstreet, Mr. Campbell, and the others whose letters you see on this page, are all successful salesmen. They have stepped into the \$10,000-a-year class—and they never sold goods before! It is hard to believe that such big success could come so quickly and easily. Yet it was all amazingly simple! Ask them the secret of their sudden success. They will tell you they owe it to the National Salesmen's Training Association. This is an organization of top-notch salesmen and sales managers formed expressly for the purpose of training men to sell and helping them to good selling positions. It has taken hundreds of men from all walks of life and made them Master Salesmen—it has lifted them out of the rut and shown them the way to magnificent earnings, to fascinating careers and big selling positions.

We Train You and Help You Land a Job

What these men have done, you can do! In your spare time at home you can easily master the secrets of selling that make Star Salesmen. Whatever your experience has been—whatever you may be doing now—whether or not you think you can sell—just answer this question: Are you ambitious to earn \$10,000 a year? Then send me your name quick! I will prove to you without cost or obligation that you can easily become a Star Salesman. I will show you how the Salesmanship Training and Free Employment Service of the N. S. T. A. will help you to wonderful success in selling.

Free Book on Salesmanship

Just mail the coupon or write for our great illustrated book, "A Knight of the Grip," which we will send you free. Let us prove to you that regardless of what you are doing now you can quickly become a Star Salesman. Let us show you how you, too, can step into the ranks of the big money makers of business. See how easily you can learn this fascinating, big pay profession at home in your spare time. Learn what we have done for others and what we stand ready to do for you. Don't put it off until tomorrow—write us today. Mail the coupon at once.

National Salesmen's Training Association

Dept. 12-B, Monadnock Bldg.

Chicago, Ill.

National Salesmen's Training Association

Dept. 12-B, Monadnock Bldg.

Chicago, Ill.

Please send me, without any obligation on my part, your free book, "A Knight of the Grip," and full information about the N. S. T. A. system of Salesmanship Training and Employment Service. Also a list showing lines of business with openings for salesmen.

Name

Street

City..... State.....

SWEENEY

I PAY YOUR RAILROAD

This Is
"E. J."



Learn a Trade and Get A Good Job

I know that there is a great future for every man who will take my advice as thousands of others have. The only question is, **Are You Mechanically Inclined?** If you are, then **TODAY IS YOUR OPPORTUNITY.** No

matter what you are doing—what you have been doing—I am sure that the Automotive Business offers you bigger—better—

more prosperous future. I want to see you grasp your big opportunity right now—and remember its the trained man that gets the big paying jobs.

I Will Pay Railway Fare to Kansas City

My Big Announcement this Season. You can come to this great Trade School at no more expense than if it were located in your home town, for I am rebating fares from any point in the United States to the Sweeney School. No advance in tuition. No extras. Just a fair, square rebate. No matter where you live this brings the Sweeney Million-Dollar Trade School to your door.

Thousands upon thousands of young men thought as you have been thinking about **MECHANICAL TRAINING** and they answered my advertisement, got my big Free Catalog, came here, learned the business and today, in all parts of the country **ARE MAKING GOOD.** I can give you hundreds of letters from these men that relate circumstances and hopes so like your own that you will be amazed.

Begin Right

That's what I want to impress upon every man who sees the great future in the Automotive business. **COME TO SWEENEY'S**—the School of practical Experience. Sweeney Graduates are in every part of the U. S. and in foreign countries—over 46,000 of them—and they are loyal Sweeney boosters. They are proud of **THEIR SCHOOL**—their success in business is creating demand for thousands of Trained Mechanics and they look to the **OLD SCHOOL** for these men. Hundreds of letters come to my desk—these boys of mine write me personally—They want **SWEENEY GRADUATES**—every day—every week brings more openings. Again I say **START RIGHT**—come direct to the **SWEENEY SCHOOL**—and in 8 short weeks you will have a Sweeney Diploma—it commands recognition for you. Don't delay—send for my **BIG FREE BOOK** today—I want to tell you of my **Big New Special Offer**—this is in addition to my Free Railway Fare offer—it's the greatest offer that I have ever made.

EMORY J. SWEENEY, President.



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Tire Vulcanizer	\$100 to \$200
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Auto Mechanics	\$6.00 to \$10 a day
Auto Electricians	\$225
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Hundreds of Openings for Men

SWEENEY trained men are in demand everywhere at good wages, **\$50 a week and more**, from garages, tire shops, welding concerns, auto repair shops, etc. **HERE'S THE PROOF:**

South Dakota wires: "Will pay most any price for a good man. Send him right away." New City, Mo., says: "Put us in touch with a first-class repair man. Excellent opening." Indiana says: "Want one more Sweeney man for my new garage. Steady work at good prices." Kansas appeals: "Send me man who understands Ford Car from A to Z. Will pay top wages." Mississippi telegraphs: "Want a post graduate mechanic. Will pay all he is worth. Wire at my expense." Florida calls: "Want head mechanic. Will pay \$50 a week. Let me hear by return mail." **Thousands of Sweeney graduates now owning their own business** in various parts of the country **naturally favor Sweeney trained men.** Sweeney loyalty is wonderful. Our daily mail is conclusive proof that the trained man with the SWEENEY diploma can secure jobs like these at **\$50 a week and more.**

The Sweeney System

THE SWEENEY SYSTEM, famous the world over, can be had only in the Sweeney School. It trains men to be mechanics by practical work. You learn by doing—no books—you do the actual work. The course takes only 8 weeks. No place in the world can you get so much real instruction—so much actual value, for so little money. If you are in earnest, there is a real job looking for you. Write me today—don't put it off—I've got some information that will open your eyes—but you must take the first step—Write for my Big Free Book.

My Big Special Offer I am offering to pay your railway fare from any point in the U. S. I have another offer—a bigger offer to make you—an offer greater than I ever made before—Mail the coupon today.

Send for My Big Free Catalog Now

GET INTO THE FASTEST GROWING BUSINESS IN AMERICA AND MAKE BIG MONEY. Thousands of good jobs go begging. There is over a quarter million dollars more invested in the Automotive business than the entire capitalization of all our National Banks. This is a business you are interested in—now is the time to make a start—reconstruction in the Automobile business is well under way—factories are getting back on full time—we're just on the eve of greater opportunities in the Automotive business than ever. Trained men—expert mechanics will be in demand as never before—they are in demand today—the SWEENEY SCHOOL stands as a great monument to thousands of successes—thousands of men who came to the Sweeney School and today are known as successful men in the business world. You can do what these men have done. The big paying jobs are open to you and This Million Dollar Trade School is now placed right at your door—no matter where you live in the U. S., for I am paying your railway fare.

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I will gladly send my 72-page illustrated catalog **FREE**. Also a free copy of Sweeney School News, a most interesting monthly school paper, published here. You will enjoy them. Read the worth-while stories of men like yourself who came to Sweeney's and found success. Read how Frank Powell and Harry Wilson built up a \$20,000 business in about two years after graduating. Read how Elbert A. Pence built up a \$25,000 yearly garage business at Clearmont, Mo. These stories and many more are told by the Sweeney students. Also I want you to learn how my students enjoy themselves after work in the swimming pool, the club and reading rooms, etc.

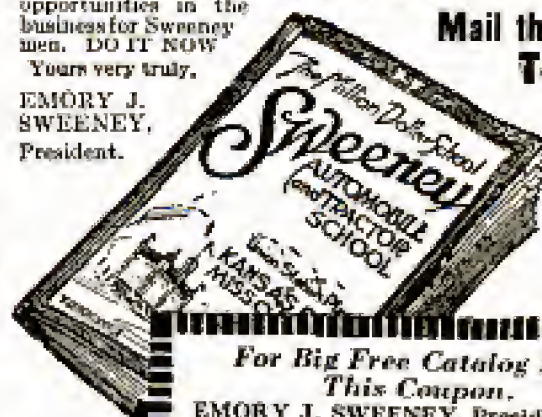
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P. O. State.....

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You can have this complete Drawing Outfit absolutely free. It has everything needed:—A drawing board, "T" square rule, French curve, protractor, triangles, triangular boxwood scale, erasing shield, drawing ink, pencils, erasers, paper, etc. The coupon will bring you information as to how you can get this splendid outfit free.

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There are few professions that offer greater possibilities than that of the expert draftsman. If you want to get into a line of work that is uncrowded—where the job will seek you—where you will earn \$50.00 a week or more, then here is your chance. Become a trained draftsman.

Thousands of Jobs Are Open

for the trained draftsman. Right now, while a great number of men of other lines of work are out of work you won't find the trained draftsman hunting for a job. The demand for men in this line far exceeds the supply. Take advantage of that fact, and without quitting your present job, in your spare time, get the preparation that will fit you for this profitable profession. **YOU NEED NO PREVIOUS TRAINING.** An hour or two after supper is all the time you need and in a few months you will have mastered this interesting job.

Our Free Employment Service

will assist you in placing yourself to the best advantage in this well-paying profession. Our improved system of practical instruction has reduced the method of becoming efficient in this work to a very simple process. It will help you to cash in quickly on your natural ability.

Don't Turn This Page Until You Have Made Up Your Mind to find out all about our free offer to you. The coupon will bring full information and our free book. Send for it today—right now.

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You don't need to wait until you have saved up all the money you need to get this Electrical education. Our Welfare Department will help you get a part-time job at which you can earn money to help pay your way.

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If you enroll within a limited time you can get the full course in Automobile, Truck and Tractor Electricity without paying a cent above the cost of the Practical Electrical Engineering course. This is the finest course in America. The equipment is complete in every detail, and you get your instruction under experts in this branch of electricity. This training opens the way to get into a big paying business of your own—you learn wiring, lighting, lighting and starting systems of all cars, trucks and tractors. You learn how to make and repair batteries. You can open a battery service station and look after the repair and maintenance of auto electrical systems.

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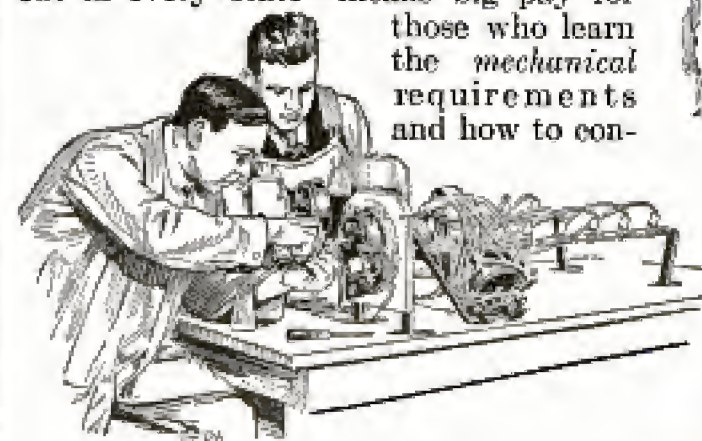
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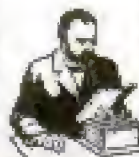
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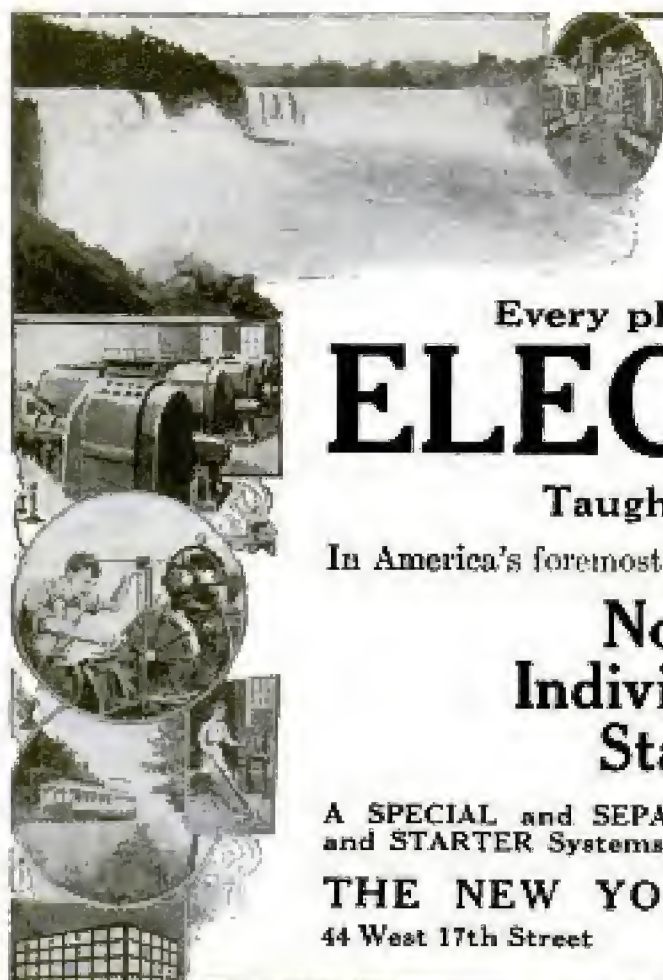
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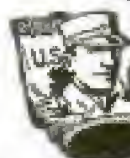
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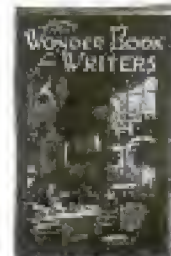
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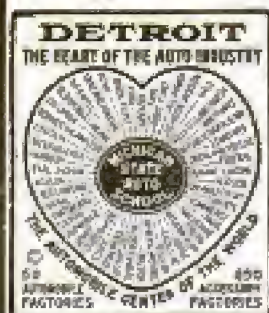
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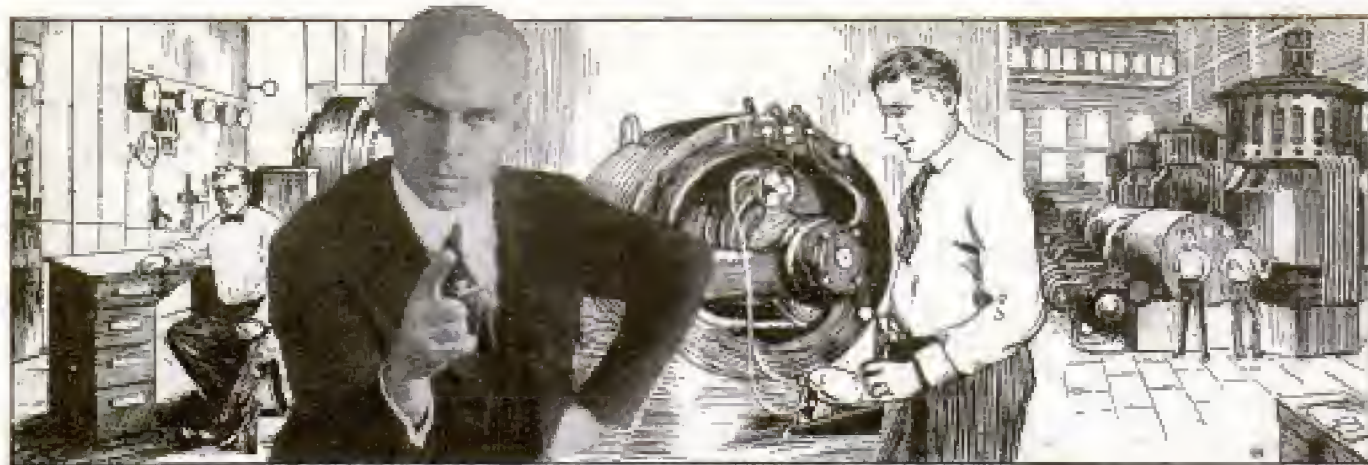
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MY "Sureshot" Selling Method Free to Agents. K. Home, 1957 Warren, Chicago.

PATENTS—Trademarks. Before disclosing an invention, the inventor should write for my blank form Evidence of Conception. This should be signed, witnessed and returned to me with sketch or model, upon receipt of which I will promptly render opinion as to patentable nature and send booklet on Patents. Highest references. Prompt attention. Reasonable terms. Clarence H. O'Brien, Registered Patent Lawyer, Woodward Bldg., Washington, D. C.

DOUBLE your money. Sell to druggists and homes: Electronic medicinal Berba, blood purifier, stomach tonic, colds, grip, etc. Polish, Bohemian, Russian, Slovak, etc., agents establish a steady income. Great demand. 50 cents in stamps for sample worth \$1.00, returned if agency accepted. Exclusive territory for crew managers. Electronic Remedy Co., 2005 N. Robey St., Chicago, Ill.

\$15 A DAY Easy—Red Hot Seller. "Simplex Ironing Board Covers." Something new—just out. Women buy this article on sight. Your profit \$9 dozen. Easily sell one to two dozen daily. New agent sold eight in 40 minutes. Write quick. W. J. Lynch, Box 621, Springfield, Ill.

COUNTY distributors wanted throughout the entire country on automobile accessories manufactured by an old and established firm. All live items, big profits, nets 100%. Easy seller, as every car owner a prospect. Write for details. Dept. A, Muto Manufacturing Co., Incorporated, 616 W. Monroe St., Chicago.

AGENTS—Make big money selling Cain's Claw Brush Cleaners—Newly patented—Nothing like it—No competition—Sells on sight. Send 15c for sample and particulars. The Den-Wal Sales Co., Dept. C, 180 Market St., Newark, N. J.

SELL like hot cakes; big profits; ironing wax pad and asbestos rest, perfumes clothes; working outfit, 10c. Yankee Mfrs., 349 Atlantic Ave., Brooklyn, N. Y.

AGENTS—Wanted—Men or women. Mother Goose Whinger Map is a whitewind seller. New—Patented—Perfect. Demonstration means sale. Retail \$1.50. More than 100% profit. Sample mailed \$1.00. The Alpine Company, 4523 Euclid Avenue, Cleveland, Ohio.

PROTECT your rights. Write for "Record of Invention" which contains forms to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Reaney Kelly, 612 G. Columbian Bldg., Washington, D. C.

FASTEST Selling Ford specialty on market; 500,000 will be sold next six months. Splendid proposition; write quick; \$5.00 brings sample and full details. Write O. H. Herlich Mfg. Co., Inc., Hartford, Conn.

QUICK Seller. New Improved Midget Collapsible Hangers. Strong—attractive—penknife size in leather case. Everybody wants them. 100% profit. Sample 35c. Write for details. Kallina Co., 384-B, Alabama Ave., Brooklyn, N. Y.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 624 Main, Richmond, Va.

AGENTS, we have the finest needle case. You can clear \$50.00 to \$200.00 weekly. Send 10c for sample, sells 25c. Empire Specialties Co., 1549 N. Wells, Dept. 301, Chicago, Ill.

MAKE big money selling leather bill folds and receipt cases, with name and lodge emblem Gold-stamped thereon. Postal will bring a good proposition. Fraternal Leather Goods Co., Coshocton, Ohio.

AGENTS—Distributors make 100% profit; Wonderful Mikaluth. Sells on sight; polishes silverware and other metals without powders or pastes; great opportunity for hustlers. Miller Brothers, Alkendale, N. J.

AGENTS, Cosmothers: Enormous profits selling face powder, soaps, and other toilet necessities. Permanent repeat business. Highest quality. Lowest prices. National Products, 410 E. 13th St., New York, N. Y.

AGENTS, we have 150 names of Mail Order Houses that buy mailing lists. This list sent upon receipt of \$2.00. Address: Talsafego Farmer's Directorate, Fort Worth, Texas.

AGENTS—Sell Our Marvel Can Opener. Make \$4 on every \$2 invested. Our tip—your opportunity. Write us now. Staples Mfg. Co., Mt. Vernon, Ind.

AGENTS: \$10 Daily. Selling our Vest-pocket Safety Razor. Uses Gillette Blades. Sample \$1.00. L. D. Thompson & Co., 4011 S. State St., Chicago.

AGENTS: Big Profits. Genuine Gold Leaf Window Letters anyone can put up. Scripts and 57 varieties. Chicago Agency Co., 442 Alameda St., Chicago.

AGENTS, Big Profits. Gold Sign Letters, easily applied. Best and cheapest manufactured. Samples free. Interstate Sign, Dept. C, 2629 N. Halsted St., Chicago.

MONEY easily earned quick selling self-threading needles for failing eyesight, 25c. Hundred packages \$11.25, prepaid. American Mantle Co., Anderson, Ind.

AGENTS wanted to handle good automobile accessory line. Fine commissions. J. D. Ignition Construction Co., 6724 Low Ave., Chicago, Ill.

AGENTS—Big profits selling "Wauwab Pollah" for Furniture, Woodwork, Autos, Etc. Clean and Polishes. Fritch's Laboratories, 6431 Magnolia, Chicago.

\$25 DAILY, Selling Razor Blades or Selling Finest Improved \$1.00 Double-Edge Razor. Standard Safety Razor Corp., Pittsburgh, Pa.

BIG money made silvering mirrors and plating tableware. Outfits furnished. E. Deels Laboratories, 286 Fifth Avenue, New York.

SALES representatives everywhere. Household necessity. Whitewind seller. Sample 5c. Address, Box 591, New Haven, Conn.

WANTED Distributors for patented Improved Mud Chain. For information write Maurice Frank, Anthon, Iowa.

WONDERFUL article for direct selling. Address, Sanitary Mfg. Supply, Dept. 5, Akron, Ohio.

SELL my newest, useful necktie device. Box 237, Elgin, Ill.

MEN—300—wanted at once; the Mundo Chest, something new; amusement and entertainment made universal; easily carried with you anywhere. We paid Ted Goss \$1,455 for four months' work; Grats made \$294 one week; Just made \$7,285 in six months; eight men placed over 18,000 music chests; send for terms, free sample. Thomas Mfg. Co., Class 2462, Dayton, Ohio.

\$5.00 to \$10.00 A DAY easily earned taking orders for High Grade Toilet and Laundry Soaps, Toilet Articles, Flavoring Extracts, Spices, Puddings, 7 bars Assorted Soap in Fancy Boxes, Big sellers. Our goods well known, nationally advertised. 100% profit. Write for catalog. Men and women everywhere make good money. Crofts & Reed Co., Dept. 223, Chicago.

SALES Agents, men or women; \$8 a day taking orders for new heat indicator for city and country homes. New invention. Tells exact heat in air oven. No guesswork when baking or cooking. Low price. Big demand. Every housewife wants one. Write for terms and sample. Jennings Mfg. Co., Dept. 1308, Dayton, Ohio.

AGENTS: Make \$10 to \$20 daily taking orders for pure silk and silk and wool hosiery for men and women. We deliver for you direct from mill to home. Wonderful proposition. Be the first to take orders for us in your town. Write Pure Silk Hosiery Mills, Dept. P.M., Masonic Temple, Chicago, Ill.

"HOW to Sell Patents" free. Patent News-H. Washington, D. C.

AGENTS—Brand new Wireless Umbrella. Two handles. Can be used by lady or gent. Only umbrella ever made without wires to hold stays in place. Handles collapse to fit suitcase. Not sold in stores. Popular prices. Write for sample. Parker Mfg. Co., 475 Dike St., Dayton, Ohio.

AGENTS—Quick sales, big profits. Outfit free. Cash or credit. Sales in every home for our high-class line of Pure Food Products. Soaps, Perfumes, Toilet Articles, etc. Write today for money-making plan. American Products Co., 5722 American Bldg., Cincinnati, Ohio.

AGENTS—\$50 a week taking orders for guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles and finest line of silk hose. Write for sample outfit. Thomas Mfg. Co., Class 262, Dayton, Ohio.

AIR-FILLED puncture sealing inner tubes. Fully guaranteed. Nothing like it. Autos buy on sight. Enormous profits. Exclusive protected territory for producers. Wenstone Rubber Products Co., 3025 Indiana Ave., Dept. A, Chicago.

AGENTS See our display advertisement on page 129 in this magazine, then write us immediately. Wide awake agents need no other line. Address, Sales Dept., The Kano Company, Cambridge, 39, Mass.

RAYLITE diamonds, marvelous gem discovery. True diamond color—beautiful guaranteed rings, jewelry, specialties, stretching knif buttons at factory prices. Big profits. Exclusive territory. Master Jewelers (gem), Sheboygan, Wis.

BEST and absolutely new articles for real live men to sell to trade and individuals. Big money. Fine posters. Fast sellers. Smith, 1316 N. American Bldg., Chicago.

WANTED—Agents everywhere to sell Visiting Cards and Social Stationery on generous commission plan. Write today to Forman Printery, Box 75X, Plantersville, Conn.

START your Ford in coldest weather, new invention, saves gasoline. Agents, Dealers, Ford Owners, write Jir Specialties Co., Cincinnati, O.

AGENTS' Money Maker—Presto Puncher. Sample 35c postpaid. The Idea Factory, 627 Texas St., Shreveport, La.

GRT Posted for Spring. Good prices paid for butterflies, insects. See Sinclair's Display Advertisement, page 68.

NEEDED in every home. Sells at sight. Best profits. Central Mfg. Co., Fairfield, Iowa.

HOW and What to Invent for profit, free. Patent News-A, Washington, D. C.

HIGHEST prices paid for names. Easterham Co., 1827 Welton, Denver, Colo.

800% PROFIT, Agents' Sample Free. M. Bernard, 3010 Van Buren, Chicago.

MAKE \$50 Daily. Something New! 400% profit. All business, professional men need it. Sells \$5. Costs \$1. Brooks, Texas, sold 20 first day, profit \$80. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample with free. Federal Association, 11-K Asylum St., Hartford, Conn.

POCKET Electric Flashlight generates own electricity. Never needs battery. New imported novelty. Sells at sight. Louis Frank, 2 W. 15th St., New York.

WANTED agents to sell Fineless Furnaces direct to the property owner or to the dealer. Our profit on each sale is \$50.00. Chas. F. Kulp Co., 1007-11 E. State St., Chicago.

AGENTS wanted; Automobile and Household specialties. Send for catalogue, M. W. Pettibone, 1425 Broadway, Detroit, Mich.

WOULD good durable paints and varnish 40c gallon interest you? Then write today. Dept. 2, Homelmann Bros. Mfg. Co., Indianapolis, Ind.

SALES Folks: You want a timely product; repeat orders sure; profits plenty; advancement certain; and a plan that's failure-proof? Then write us! Address: The Robb-Tyran Co., Dept. 5, Bellefonte, Pa.

"CALIFORNIA Backless Garment Mender" repairs clothing without thread. Housewives delighted. Enthusiastic agents coming money. Splendid sideline. Attractive proposition and sample package free. Address: Norman G. Orr, East San Diego, Calif.

MAKE thousands of dollars selling our exclusive Oriental Pearl Necklaces at importers prices. Enormous demand. Special sales plan mailing circulars. Write quick. McCullister Co., 1400 Union Street, San Francisco, Calif.

YOU can make \$12,000 a year selling well-known, standard, advertised make of hand-drawn chemical fire engines, motor fire apparatus, extinguishers, hose, and complete line of fire-fighting supplies. We have several openings in good territories. Other men are making \$1,000 a month in territories not so good as we now offer. Address: Ajax Fire Engine Works, Bush Terminal Bldg., 10, Brooklyn, N. Y.

GENERAL Agents. Something New. Whirlwind seller. "Repeat" washing powder. Washes clothes without rubbing. Wipes away washboards. Big profits. Exclusive territory. Write today, free package. Klitzke Co., 8 Putnam St., Tunkhannock, Pa.

GUARANTEED Brushes: 113 different kinds—household—commercial—auto. Tremendous sellers, everyone a prospect. Permanent business—Steady income. Write or wire Desk 6. Universal Brush Company, 181 Quincy Street, Chicago.

AGENTS! A sale in every home for our beautiful dress goods, silks and general yard goods. Quick sales! Big profits! Large book of 1049 handsome fabric samples. Write today. National Importing & Mfg. Co., Dept. 6X, 513 Broadway, New York, N. Y.

TAILORING Agents wanted in every town. We can use merchants, salesmen, foremen, barbers and cleaners who can sell ten or more suits a season. We ship free our large spring sample outfit showing over 250 all wool samples at \$15.00 and up for all wool guaranteed suit. This is an agency proposition. Write today for book or traveling. Dept. P., Jay Ross & Co., 411 S. Wells St., Chicago, Ill.

AGENTS—Big money, \$5 to \$16 a day. Aluminum handle cutlery set. Brand new. You display and take orders. We deliver and collect. Pay you daily. Sample free. Try it out. Jennings Mfg. Co., Dept. 1608, Dayton, Ohio.

PORTRAIT Agents—\$50,000 is what "Picture Man Friedman" made commission. Free circular "Profits in Portraits" tells how. 24-hour service prints, finished portraits, frames. Samples free. "Picture Man Friedman," Dept. 8, 127 N. Dearborn St., Chicago.

BUILD Permanent Business following our Sure Success Plan Introducing Guaranteed Hosiery and Underwear from factory to family. Attractive outfit assures quick sales. Large profits. Investigate for yourself. Address C & D Company, 41-45, Grand Rapids, Mich.

MEN and women make \$100 upwards weekly selling greatest labor and money saving household necessity. Big repeater. Good crew managers' proposition. Free sample and particulars. Holly Co., A-1, Hastings, Neb.

\$1,000 PER man per county. Get yours. Inexperienced men pulling down star salesmen's profits. Write for proof: How farmers, ministers, clerks—men in all walks of life—made big money in whole or spare time. You can do it. Amazing proposition—wanted everywhere. Exclusive territories—no sales limit. A hot or cold running water bath equipment for any home at only \$7.50. Self-heating. No plumbing nor water works required. Investigate. Terms. Send no money. Write letter or postal today. Allen Mfg. Co., 654 Allen Bldg., Toledo, Ohio.

PORTRAIT Agents—A new portrait, something entirely different. Write for particulars, also catalogue and price list. Fidelity Portrait Company, Dept. 100, 3047 Harrison St., Chicago, Ill.

Big Line—Big Profits—Cold Creams, face powders, perfumes, remedies, spices, extracts, pie fillers, baking powder. Catalog free. Western Laboratories, 1904 Van Huron, Chicago.

BIGGEST, fastest sellers. Every woman buys Hawkins' High Grade Toilet and Household Necessities on sight. 100% profit. Colonial Chemical Co., 631A Penn Ave., Pittsburgh, Pa.

A BUSINESS of Your Own—Make sparkling glass name plates, numbers, checkerboards, medalion signs. Big illustrated book free. E. Palmer, 30 Wooster, O.

WE pay \$200 monthly salary, furnish rig and expenses to all who qualify introducing guaranteed potency and stick powders. Bigler Company, X368, Springfield, Illinois.

AUTOMOBILE Accidents prevented by new invention: costs distributor \$2.50, delivered; retails at \$7; wonderful self-selling plan. Carl Brown, Manager, Dept. 32, Columbus, Ohio.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method: producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business. Write for free samples, showing finishes, etc. Gemmetal Polish Co., Ave. H, Decatur, Ill.

AGENTS—New patented article. Enormous profits. Everyone a prospect. Sample 10c. GHA, 2561 Fifth Ave., Chicago.

GALLAGHER made \$336.00 in one week selling guaranteed Collection Systems, used by all business men. Savers Cabinet Mfg. Co., 2815 Sheffield Ave., Chicago, Ill.

COPPER Pots, all sizes; also anything in copper goods desired. Write today for free catalogue. Buyer & Co., 409 Roscoe Bank Bldg., Omaha, Neb.

O-HELL-O, who didn't I see this before. \$1 an hour selling new product. Removes iron rust, mildew, fruit, ink, medicine and grass stains. Write for free sample and terms today. C. H. Stuart & Co., 24 Broadway, Newark, New York.

AGENTS Wanted to sell an improved tool that often pays for itself first time used. Address today. J. 1440 Georgia St., Los Angeles, Calif.

AGENTS, male and female, new line necessities for home, office, auto. P. O. Box 82, East Boston, Mass.

AGENTS: Self-threading needles. Every home buys. 175% profit. Sample free. Maher Co., Dover, N. J.

PORTRAIT Agents—Earn Big Money selling our Photo Medallions. Everybody buys. You charge \$3.00; make \$2.00 each sale. \$10 daily easy. Big variety designs. Quick service. Write Pudlin & Perry, Incorporated, Section 10, 340 Bowery, New York.

GOLD Leaf Sign Letters; make and sell: profits exceed 1,400%; immense demand; particulars free. Johnston Co., Quincy, Ill.

AGENTS—Tox Remedies 200%. Address Int'l. Remedy Co., 1331 Franklin, St. Louis, Mo.

Big Profits Selling New \$3.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Co., 1458W Hollywood Ave., Chicago.

FOR the Holidays. Our Ex-Gel Luminous Crucifix which "shines in the dark" is the most appropriate gift of all. An instant to demonstrate and the sale is made. Big profits. W. G. Hannan Co., Dept. B, 57 East 13th St., Chicago.

AGENTS! 1931's greatest sensation. 11-piece toilet article set selling like blazes at \$1.75 with \$1.00 dressmaker's shears free to each customer. Get lined up for Christmas rush. E. M. Davis Co., Dept. 508, Chicago.

PARTS Selling Sanitary House Line in America. Huge profit-making opportunity for men workers, with advancement. Other specialties. Get complete details. Act quick. Next season at hand. A. A. Silver-Chamberlain Co., Clayton, N. J.

AGENTS, Salesmen, Crossers, \$10 per day selling our Guaranteed Waterproof Aprons. \$4 per dozen; sample apron 50c. Meeker Sales, 192 Market Street, Newark, N. J.

AGENTS, Men or Women, full or spare time, earn \$25.00 to \$100.00 a week and be your own boss representing the Ho-No-Co Mfg. Co., manufacturers of the wonderful Ho-No-Co Toilet, the great blood purifier and system builder; some profit-maker. Ho-No-Co Medicated Skin and Scalp Soap for the baby, toilet, bath, skin and scalp; a restorer. Over 100 other fast-selling specialties, toilet preparations, perfumes, flavoring extracts, spices, medicinal preparations and household specialties. Every item a fast seller and a big profit-maker. Don't fail to ask for our free sample case offer. We furnish advertising matter and samples free of charge. Ho-No-Co representatives are successful. Write today. Ho-No-Co Mfg. Co., 154 Locust St., St. Louis, Mo.

AGENTS—Send for sample "Fretnet"—the washing wonder. Be convinced you can do a whirlwind business. You can clear at least \$20 to \$100 weekly, according to space or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credits given. Don't call. P. M. Master & Sons, 20 E. Jackson Blvd., Chicago.

WONDERFUL Winter Auto Necessity Invention. \$1.00 sale means 75 cents Profit for you. Experience unnecessary. Absolutely New Specialty. Hiley made \$108 three days. Stigma first hour made \$10. Every Automobileist buys after each quick demonstration. Carried in Pocket. Prevents Accidents. Better Service. Reduces Operating and Repair Expenses. Write Quick for Exclusive Territory and Free Sample. Secretary, Box 494, Hartford, Conn.

AGENTS—New Invention. Harper's Ten-Use Brush Set and Fibre Broom. It sweeps, washes and dries upstairs windows, screens and moss floors and does five other things. Big profits; easy seller. Free trial offer. Harper Brush Works, Dept. X, Fairfield, Iowa.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages secured. Novelty Cutlery Co., 67 Bar St., Canton, O.

IF you need good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

BE Successful Agent—Free sample outfit worth \$2.35. "Quality" beauty preparations. Make big money. Extensive line. Established 50 years. Lynas Co., 216, Logansport, Ind.

ANY man handy with paint brush can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

AGENTS Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration—our owners, homes, factories, stores practically buy on sight. Our men make \$10 to \$50 a day—exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fry-Fryer Co., 105 Fry-Fryer Bldg., Dayton, Ohio.

AGENTS make 140% profit. Iridium (luminescent) crucifix shines in the dark. Sells for \$2.00. Costs 84c. Complete line religious articles, crucifixes, bibles, switch plates, house numbers and match boxes. Novel! Crummett! Useful! Every home a prospect. Big sales. Get free demonstrating outfit. The Pioneer Corporation, 1250 W. 63d St., Chicago, Ill.

"PERELESS" Plate Glass Wind Deflectors also every car that "million-dollar" look. Most popular necessity ever invented. Handsome. Durable. Quickly demonstrated and attached. A fortune for its agents. Write Quick for liberal trial offer and illustrated booklet. Rapid Sales Corporation, 10-A, Grand Rapids, Mich.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marol Company, Tribune Bldg., New York, N. Y.

SELL washing tablets that are different. They work quicker, sell easier and at a greater profit. Get our proposition. Write Newton & Co., 1 Main St., Newark, N. Y.

WRITE for particulars; best article ever offered men; costs 5c, sells quick for dollar; \$15 daily; sworn statement. Beach, 22 Express Bldg., San Diego, Cal.

FREE—Formula Catalog. S. & H. Laboratories. Reptan Building, Chicago.

SELL necessities. Everybody needs and buys the "Business Guide." Bryant cleared \$500.00 in July. Send for sample. It's free. Nichols Co., Box 4-B, Naperville, Ill.

SEEN letters for windows at honest prices. Genuine gold leaf. \$50 week easily made. Chicago Sign System P., 150 W. Austin Ave., Chicago.

AGENTS make 500% profit handling Auto Monograms. New Pictures, Window Letters, Transfer Flags, Novelty Signs. Catalog Free. Write Hinton Co., Star City, Ind.

AGENTS: Men and women. In spare or full time, make big money selling household necessities. Every home a prospect. Quick sales, big profit. Territory open. Write for particulars. Judd & Leland Manufacturing Company, Box 21, Clinton Springs, N. Y.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Prospect Mfg. Co., 55 Main St., Brooklyn, N. Y.

STOP Making Money for Others. Manufacture These Goods Yourself From Miller's Guaranteed Manufacturer's Formulas—Profits Enormous, Investment Small. Business Quickly Established—Stamp Brings Valuable Literature Regarding Mopico Windshield Cloth; Amazon Rubber Repair Laundry; Stovall, Bluing Paddles, Mexican Yucca Soap, Food, Automobile, Household Specialties in all lines. Get this valuable literature. Miller Chemical 4084 Reliable, Established 1897, Tampa, Florida.

LARGE shirt manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big values. Free samples. Madison Mills, 503 Broadway, New York.

MAKE 600% Profit. Free Samples. Lowest priced Gold window letters for stores, offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline. Acme Letter Co., 2806-D, Congress, Chicago.

AMERICAN booster auxiliary water carburetor makes autos burn water. Eliminates carbon. Low cost; liberal profits; details free. American Co., Dept. 178, Cincinnati, Ohio.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. C. L. W. Spring Oiler Co., San Diego, Calif.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-3, 57 E. 13th St., Chicago, Ill.

AGENTS—New patented curtain rod, necessity in every home; big profit; 4 to 10 sales at every house. Write for free sample. Home Curtain Rod Co., Providence, R. I.

CALIFORNIA Roadheads selling like hot cakes. Agents earning money; new stuff. Big profits. Catalog free. Mission Road Co., PM-2819, West Plac., Los Angeles.

AGENTS: Big Money Monogramming By Transfer Method. Catalogue Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

SELL Pudding Powders—Delicious dessert. Fast sellers; quick repeaters; big profit. Send for terms and sample. C. M. Stuart Co., 65 Union, Newark, New York.

AGENTS make one dollar per hour selling "De Luxe Art Panels." Newest thing in art. Men with automobile make forty dollars per day. Tremendous demand. Write for samples and expense money. Consolidated Portrait Co., 325 North Green St., Chicago.

\$200 WEEKLY. Free samples. Sell gold sign letters to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Acme Letter Co., 2806-D Congress, Chicago.

MAKE \$25 to \$50 Week representing Clow's Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clow Company, Desk 31, Philadelphia, Pa.

YOU can letter Automobiles, Buses, Trucks, etc., without any previous experience by Transfer Process. Make \$27.50 on \$2.50 Outfit. Auto Monogram Supply Co., 16 Green St., Newark, N. J.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 140 N. Wells, Chicago.

AGENTS and portrait men. Crew managers. We give you more for your money. Better and quicker service. Lowest prices on frames and glass. Refects credited. Catalog free. The Pioneer Corporation, 1250-A West 63rd St., Chicago.

FAST-SELLING Sanitary Brushes, Mops, Dusters. Positively best house-to-house line in America. Write and be convinced. Sanford Brush Co., 344 W. Lake St., Chicago.

AGENTS Make \$10 a day selling Presur-o-mat Treasur printer and creaser. Connolly, 170 Greenwich St., N. Y.

WE Start You Without a Dollar. Soups, Extracts, Perfumes, Toilet Goods. Expertise unnecessary. Carnation Co., 201 Olive St., Louis.

AGENTS: Big profits, Best and cheapest window letters made. Easily applied. Dime brings 250 samples. Particulars free. Stahlite Co., 1115 Second Ave., New York.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Refects credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 492 Blue Island Ave., Chicago, Ill.

MAKE \$2 an Hour. Article that removes iron rust, grass, medicine, fruit, mildew stains. Cleans Panama and Straw Hats. Bleaches clothes. Sells Every home. Write for free demonstrating outfit and start taking orders at once. Christy, 31A Union, Newark, N. Y.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

AGENTS make a dollar an hour. Sell Mendels, a patent patch for instantly mending leaks in all materials. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

WANTED—Tailoring Sales Agent—Make big money from very start—\$60.00 to \$75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred woolsens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars, giving your experience as salesman or tailor's sales agent. H. P. Foster, Sales Manager, Lock Box 483, Chicago.

AGENTS—Best seller: Jam Rubber Repair for tires and tubes; supersedes vulcanization at saving of over 300%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

AGENTS—If you are making less than \$300 a month our proposition on Sentinel Burglar Alarms, for windows and doors will interest you. Many agents earn \$20 daily. Brand new inventions. No wires, batteries or noise. Instantly attached to any door or window. Handsomely nickel plated. Sell on sight. No competition. Provides cheap burglar insurance. Big money makers. Write today for extremely liberal terms to agents. Sentinel Alarm Co., 140 S. Dearborn St., Chicago, Ill.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address. 25c Stamping Outfits, Emblem Checks, Check Pobs, Name Plates. Hart Mfg. Co., Desk 2, 308 Degraw St., Brooklyn, N. Y.

MOST Wonderful Seller. 94c profit every dollar. No stock to carry. License unnecessary. Sample free. Mission Road Co., 1017 Irois, Los Angeles, Calif.

AGENTS—Advertising Pencils, ready sellers, excellent sideline. Write for proposition. North American Pencil Works, 501 Plymouth Court, Chicago.

YOU can be your own boss with our Key Check outfit. Good for \$3 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 143 Ninth, Washington, D. C.

BIG money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

EXCLUSIVE rights to five agents on universal fabric cement. Mends socks and clothing, rubber and leather without needle and thread. Sells to housewives and merchants. Big profits. Intersales Company, Old Whitney Bldg., Detroit, Mich.

POLMET Polishing Cloth cleans all metals. Remits 25 cents. Sample free. Gale & Co., Inc., 13 Edinboro St., Boston.

FREE—Complete "Sanitary Cooking Ware" outfit; cost agents one dollar. Refunded on first order. National Pottery, Roseville, Ohio.

HIGH-GRADE SALESMEN WANTED

FOR 1922 we will increase our sales force. Some valuable territory open. If you are a real salesman and want to build a permanent business, aided by our co-operation and national advertising, with success assured from the start, write today. Goods sold to hardware, drug and general stores. Splendid commissions with liberal weekly advances to producers. Continental Company (Established 1866), 1022 Euclid Ave., Dept. 200, Cleveland, O.

SALESMEN and agents, write for money-making offer selling Toys. 33 1/2% profit. Easy sales. Eastern Toy Co., 30 Lenox St., Worcester, Mass.

LEARN the secrets of Star Salesmanship and qualify for \$3,000 to \$10,000 a year as City or Traveling Salesman. Free Employment Service. Send now for free book about our amazing system, also list of lines. National Salesmen's Training Association, Dept. 128B, Chicago, Ill.

AMBITIOUS men, write today for attractive proposition, selling subscriptions to America's most popular automobile magazine. Every car owner, mechanic, garage-man interested. Quick and easy to sell. 100% profit. Pleasant work. Devote all or spare time. Automobile Digest, A-505 Butler Bldg., Cincinnati.

SALESMEN can make \$5.00 a day selling our Calendars, Fans, Pencils, Signs, Advertising Novelties, Yard Sticks, Whistles, etc. Liberal terms. Sells entire year. Fine side lines. Local and traveling agencies. Model Calendar Company, Dept. 226, South Bend, Ind.

SALESMEN: Make extra money easily. Sell our Accident and Sickness policies in your spare time. \$5,000 death, \$25 weekly benefit for \$10 yearly. Address North American Accident Ins. Co., Dept. K-26, Newark, N. J.

SALESMEN: \$250.00 to \$500.00 a month easily earned by the right man. Splendid new proposition for high grade salesman as Fraternal Organizer. Unquestionable references insisted upon. Fraternal Order Elks, Liberty Building, Philadelphia.

\$300 PER month and bonus guaranteed salesman successfully demonstrating wonderful new adding machine. Details \$15.00. Work equals \$350 machine. Genuine opportunity. Full time or side-line. Lightstar Calculator Co., Dept. G, Grand Rapids, Mich.

AGENTS—\$60-\$200 a week. Free samples. Gold sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 431-E N. Clark St., Chicago.

HIG Profits Easy. Duplex Transformers needed on every auto. Save gas. Easily sold. Exclusive Distributors wanted. Jubilee Mfg. Co., 32 E. C. Omaha, Nebr.

OIL Gauges for Fords. Remarkable new invention. Sells on sight. Big profits easy. Exclusive distributors wanted. Address Sales Mgr., 22 E. C. Omaha, Nebr.

HAVE exclusive territories to allot on quick selling advertising specialty. Address, Carry-ette Bag Company, 521 Cedar St., St. Paul, Minn.

SALESMEN with knowledge of auto engine. Fine opportunity. Marquette Mfg., 319 W. Ohio St., Chicago.

BENDING Machines. Cold bending all metals, tremendous savings, latest invention. Profitable commission. Gordon Mfg. Co., Los Angeles, Calif.

\$200 TO \$400 Weekly. Free Samples. Lowest priced Gold Sign Letters for Stores, Offices. No experience necessary. Large demand. Appoint subagents. Excellent sideline. Acme Letter Co., 2300H Congress, Chicago.

WANTED—Capable salesman to market fast selling automobile accessory. Unlimited sales during winter — exclusive territory — large profits for energetic men. Address Monroe Manufacturing Co., Box 1144, Mobile, Ala.

SOMETHING New, a necessity. All business and professional men need it. Sells \$7.50, costs you \$2.50. Big repeater. Sample free. Exclusive territory. Merchants Assn., Minneapolis, Minn.

SIDE Suspenders, \$1.00. "Outfitter"; featherweight, indestructible aluminum; shirt down, pants up; no pressure on vital organs; enormous seller (send sample set free). Woods, 501 North Seventh, St. Louis.

SELLS on Sight—The Perco-Pot—a patented aluminum cooking utensil that cannot burn or boil over. Needs no watching. Food needs no stirring. Cooks thoroughly by percolation. Nationally advertised, already sold direct to thousands of housewives. Most phenomenal seller of the season. Here is a fortune for good salesmen and crew managers. Exclusive territory and liberal assistance. Write Perco Ware Company, Desk 16, Milwaukee, Wis.

\$20.00 A day easily made introducing Race-War Auto-Life—The newly perfected paste auto polish; demonstrates in two minutes. Makes old cars look new. Details for \$1. Every car owner buys. Send \$1 for 2 full size cans, instructions, territory reservation and free sample-cans offer. Sheldon Booth & Co., 922 East 41st St., Chicago.

BOOPFIX, Floorfix, Fixanamel, Shinglefix, Rustfix, Glazefix, Cementfix, Silverfix; Great Profit Making Sellers; Retail and Trade. New Reduced Prices. Salesmen Wanted Every Town. Bruce made \$600 One Day, One Order. Others making spare time \$100 weekly; whole time \$300 to \$1500 monthly. Big Chance—Connect Quick. Empire Products, 1533 Chestnut, Philadelphia.

MANUFACTURER offers unusual opportunity to experienced sales manager capable of organizing crew to cover drug and grocery trade in your home territory. This is an opportunity of a lifetime for the right party. Product is fastest seller ever offered trade and the repeat business is simply phenomenal. Tremendous demand already existing with absolutely no competition. Profits should run from \$15,000 to \$35,000 per year. All replies considered confidential. State experience and qualifications fully. Boardley Specialty Co., Rock Island, Ill., Desk P.

LIVE Wire Distributors and Dealers everywhere make money selling Seal-Fast inner-tube repair kits because of the unequalled efficiency and our aggressive and helpful sales promotion and advertising co-operation. Write Sales Manager for particulars, Robert M. Bowes Co., Indianapolis, Ind.

WANTED—Salesmen—soaps, greases, oils; oil manufacturer. Baum's Castorine Co., Rome, N. Y.

VENDING Machines—Peanut, Match and Gum Vendors. Excellent line—Big Commission. Standard Adv. & Printing Company, Ft. Scott, Kans.

EVERYBODY Eats Every Day. You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee, and entire line of groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hiltchew-Hill Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

57 MILES per gallon made with new patented gasoline Vaporizer. Write for particulars. Vaporizer Co., Pukwana, S. Dak.

SALESMEN for Patented Cigar Lighters and Cigar Case Makers. Sell to Cigar Stands everywhere. Thousands in use. Exclusive or side line. Start Now. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MAKE \$60 Daily. Something New! 400% Profit. All Business, Professional Men Need It. Sells \$5. Costs \$1. Profits, Texas, sold 20 first day, profit \$40. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. Federal Association, 11-D Asylum St., Hartford, Conn.

HELP WANTED

AMBITIOUS men, write today for attractive proposition, selling subscriptions to America's most popular automobile magazine. Every car owner, mechanic, garage-man interested. Quick and easy to sell. 100% profit. Pleasant work. Devote all or spare time. Automobile Digest, A-505 Butler Bldg., Cincinnati.

SUCCESS—Be an Automotive Electrical Specialist. Learn starting, lighting, ignition; generator, armature, magnet work; battery building, repairing. We pay fare 1,000 miles Denver. Greatest School, Free booklet. Johnson's Automotive Electrical School, 729 Broadway, Dept. 1, Denver, Colo.

CLERKS for Postal Mail and Government Field Service. \$125 month. Experience unnecessary. For free particulars of examinations, write J. Leonard (former Civil Service examiner), 25 Equitable Bldg., Washington, D. C.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522 Hannibal, Mo.

BOYS—Men. Become automobile experts. \$45 week. Learn while earning. Write Franklin Institute, Dept. W-401, Rochester, N. Y.

EARN \$25.00 daily taking orders for All-weather Raincoats. Permanent proposition, repeat orders. Experience unnecessary. No capital required. Write quickly for folder 8. Field Manufacturing Co., Mount Vernon, N. Y.

FIREMEN, Brakemen, Baggage-men, Pullman and train porters (colored). 310 Railway Bureau, East 39, Louis, Ill.

WORK for your government. Men, Women, over 17. Steady. No "layoffs." Pleasant work. Short hours. Paid vacation. Commences \$90-\$135 month. Quick raise. Become Railway Mail Clerks—City Mail Carriers—Postoffice Clerks, Customs Clerks. Common education sufficient. Write immediately—today—for free list positions. Franklin Institute, Dept. A-3, Rochester, N. Y.

\$125 MONTH commences. U. S. Government Railway Mail Clerks. Men, Boys over 17. Steady. Vacations. List positions free. Write today sure. Franklin Institute, Dept. A-21, Rochester, N. Y.

WANTED—Men who want to earn good money while learning and establishing permanent business for themselves. Fickel & Co., 363 Commercial Bldg., Newark, N. Y.

MEN—Women, over 17. Get Government jobs. Steady. \$80-\$125 month. List free. Write immediately. Franklin Institute, Dept. A-21, Rochester, N. Y.

BECOME Government Railway Mail Clerks. \$125-\$195 month. List positions free. Write immediately. Franklin Institute, Dept. A-21, Rochester, N. Y.

HIG money made silvering mirrors and plating tableware. Outfits furnished. E. DeLo Laboratories, 230 Fifth Avenue, New York.

GOVERNMENT wants Railway Mail Clerks. \$125 month. List positions free. Franklin Institute, Dept. A-21, Rochester, N. Y.

BE a Finger Print Expert. Particulars free. National System, 138 E. 7th, New York.

WOMEN—Girls. Become Dress-Gown Designers. \$135 month. Sample lessons free. Write Franklin Institute, Dept. W-587, Rochester, N. Y.

GOVT. Positions Open. Railway Mail, Postoffice, Field Service, Auditors Income Tax. Short hours; Vacations; Sick-leave on Pay. Prepare for coming Examinations. Send for full particulars and free booklet "M-1." Federal Service League, Box 1237-A, Washington, D. C.

NEW and used books; Practical, Mechanical, Automobile, Business, etc., sold and rented. Bargains. Catalogue free. Lee Mountain, Box 161, Pisgah, Ala.

WANTED men. Become Automobile Experts. \$35 week. Sample lessons free. Write Franklin Institute, Dept. A401, Rochester, N. Y.

GET Posted for Spring. Good prices paid for butterflies, insects. See Sinclair's Display Advertisement, page 38.

GOVERNMENT needs Railway Mail Clerks. \$125 to \$195 month. Write for free specimen questions. Columbus Institute, Columbus, Ohio.

MANUFACTURERS of the most wonderful and efficient fire pumps made want representatives in every locality. Some capital required. Big profits. Exclusive territorial rights. Send Five Dollars for shade and triple cylinder types, and get our liberal offer. Roberts Brass Co., Milwaukee, Wis.

SHOES—High grade, for men, direct from manufacturer. Send for proposition to salesman. No deliveries or collections. Commission daily. Quick Shoe Co., Brockton, Mass.

UNITED States Government Wants Men. Excellent positions at attractive salaries. Railway Mail Clerk Examination soon. Let our expert (former United States Civil Service Examiner) prepare you for this and other fine positions. Write today for free catalog P.M. Patterson Civil Service School, Rochester, N. Y.

DISTRICT Manager: 150,000 sales of a household appliance in New England have paid District Managers upwards of \$3,000 yearly. We are ready to expand. Office work entire or side line. The Recore Co., 64 Broad Street, Milford, Conn.

BE a Railway Traffic Inspector! \$10 to \$250 monthly; expenses paid after 3 months' spare-time study. Splendid opportunities. Position guaranteed or money refunded. Write for free booklet CM-45. Stand. Business Training Inst., Buffalo, N. Y.

GOVERNMENT Wants Railway Mail, Postoffice Clerks. Other positions. Salary \$125 month. Experience unnecessary. Write for information concerning positions and instruction. Columbia School of Civil Service, 411 Pope Bldg., Washington, D. C.

LOCOMOTIVE Firemen. Beginners \$150, later \$250 monthly, for railroads nearest their homes, everywhere in United States and Canada. Address Railway Association, Desk M-1, Brooklyn, N. Y.

START a Paying Business of Your Own. Be a business man. Any location. 2,000 new Tire Vulcanizing and Repair Stations needed. Business always good. Are you ambitious? \$100 will start you. Write at once. Wonderful opportunity. Equipment Co., 175 Canal, Cincinnati, Ohio.

SILVERING mirrors. French plate taught. Easy to learn, immense profits. Plans free. Wear Mirror Works, Excelsior Springs, Mo.

WRITE Articles, stories, news, in spare time for newspapers and magazines. Big pay. Copyright back free. Press Syndicate, 551 St. Louis, Mo.

GOVERNMENT Clerks Needed soon. (men-women). \$1600-\$2500. Permanent. Free to travel. Write Mr. Osmont, Former U. S. Government Examiner, 401 St. Louis.

SIGN Letter Agents and Painters; 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can set out. Big demand. Free samples. Metallic Letter Co., 331D N. Clark St., Chicago.

CALIFORNIA Households selling like hot cakes. Agents earning money. Absolutely new. Big profits. Catalog free. Mission Head Co., 8P2819 West Pico, Los Angeles.

SALESMEN—Become Independent. Own your business; experience unnecessary; selling our \$7,500 Accidental Death, \$50 Accident, \$15 Sick Weekly Benefits; \$12.50 yearly; other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited Insurance Department, Registration Dept. A, Newark, N. J.

INVENTORS desiring to secure patents should write for our book. "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 520 F, Washington, D. C.

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. Sign Sign System, St. Antoine St., Detroit, Mich.

MAKE money writing Photo-ads; details free to beginners. No correspondence course. Producers' League, 230 Wagonwright, St. Louis.

WANTED: Railway Mail Clerks—\$1,600 to \$2,300. Exams everywhere. Write today for full information. Patterson, Civil Service Expert, Box 4025, Rochester N. Y.

FOR ADVERTISERS

SPECIAL: Inch Display Advertisement 150 Magazines Thrice \$15. Page \$200. Wood's Popular Services, Atlantic City.

ADVERTISE. Country town newspapers. Lists free. Pennell Company, Cornington, Ky.

INTERNATIONAL Opportunity contains inspiring, pep-inspiring, Success-Compelling articles, poems, ideas, etc. (Copy 10c, Trial 25c Monthly 25c). Worldwide Circulation! Buy! Sell! Trade!—Everything!—Everywhere! In Word, 50c Inch. 2279 First Ave., New York.

YOUR 25-word ad. in 75 magazines \$1.00. Riley, Publisher, 1923 S. 50th Court, Cicero, Ill.

"COMMERCIAL Engraving and Printing," a remarkable new book by C. W. Hackleman, will answer any and every question which may arise concerning these subjects. A vast amount of time and thousands of dollars were expended to make this the most practical and complete book on engraving and printing and allied subjects ever published. Over 300 pages and 1500 illustrations presenting over 3500 distinct items on 35 separate subjects. Cloth binding. Price \$15 prepaid. We highly recommend this book. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

ADVERTISE in 1,000 Corn Belt Weeklies. \$10.00 line. 25 words. 24 big Dollars. \$15.00. Booklet free. Address Union Advertising, Baltimore Bldg., Chicago.

INFORMATION

DEPENDABLE Information of practically any kind obtained and furnished for \$1.00, or money refunded. We also act as special representative in behalf of inquirers, if desired. Bank references. Address Banka Service, 307 Jenkins Bldg., Kansas City, Mo.

LETTER SPECIALISTS

DO you want to sell? Let my letters do it. Letters \$4.00. Leon Hatfield, Herndon, Kan.

HIGHEST Payers on Earth—Jacobus Letters. \$3.50. Jacobus Advertising Service, Irvington, N. J.

SUCCESSFUL sales letters. \$10. Results or fee returned. Free suggestions. Morse, 123 W. 103rd, New York.

ATTENTION—Gripping, desire-creating sales letters. So strenuous they have to bring business. Beall, 200 East 87th, New York.

SECURE the position you want. I can give you genuine assistance. Particulars free. Floyd V. Stader, Canadian, Texas.

BUSINESS SERVICE

INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southeastern Securities & Investment Co., Box D488, Phoenix, Ariz.

LITERARY SERVICE

WE Prepare Lectures, Speeches and original special articles. Expert Service. Manuscripts revised, placed. Herald Publicity Service, 415 Bristol Building, New York.

MAILING LISTS

MAILING Lists. New opportunity seekers, 1,000 names, \$1.00; 500, \$2.50. Knapp, 733 Fifth Ave. St., Milwaukee, Wis.

REACH best paid workers in Grand Rapids, Saginaw, Battle Creek, and Muskegon through our advertising columns. Two cents a word. Address, Michigan Associated Labor Press, Houseman Bldg., Grand Rapids, Mich.

4,000 NAMES of Dallas County farmers, showing acreage and amount assessed to each, sent upon receipt of \$2.50. Address Tallafere Farmer's Directories, Fort Worth, Texas.

TYPEWRITERS AND SUPPLIES

UNDERWOOD Typewriters at far less than manufacturer's price; rebuilt, all worn parts replaced, guaranteed good as new. Cash, installment payments. Write for Catalogue 1512. Typewriter Emporium, 1512, 1512, Montross and Ravenswood Ave., Chicago, Ill.

TYPEWRITERS, all makes, \$15.00 up; fully guaranteed. Shipped one month's free trial. Send today for catalogue and agent's proposition. Address Prekahl Typewriter Exchange, Prekahl, N. Y.

TYPEWRITERS, \$20.00 up. All makes. Easy payments. Free trial. Payne Company, Rosedale, Kans.

REBUILT Typewriters. All Makes, \$10.00 Up. We sell for cash at prices 20 to 30 per cent lower than installment houses. Every machine fully guaranteed. Send for free descriptive circular. The M. & M. Typewriter Co., 42 N. Wells St., Chicago.

FIVE-DAY Free Trial—Underwoods—Remington—Smith—Royal—Oliver, etc., \$3 deposit, balance small monthly payments. Five-year guarantee; liberal discount for cash. Write for catalogue before buying. International Typewriter Exchange, 177 N. State St., Dept. A-5, Chicago.

DUPLICATORS AND DEVICES

"MODERN" Duplicators. Business Letters \$2.25 up, 50 copies from pen, pencil, typewriter. No glue or gelatin, 40,000 in use. Free trial. Send card Booklet Free. J. E. Durkin-Reeves Co., Pittsburgh, Pa.

"QUICK Process Duplicators," Makes 100 copies in 10 minutes. Remarkable time savers. Thousands in use. Circular Free. Herer Duplicator Co., 160-194, N. Wells St., Chicago.

ADDING MACHINES

FREE Trial. Marvellous new Adding Machine. Adds, Subtracts, Multiplies, Divides, automatically. Work equals \$250.00 machine. Price only \$15.00. Speedy, durable, handsome. Five-year guarantee. Used by largest corporations. Write today for catalogue and free trial offer. Lightning Calculator Co., Dept. E, Grand Rapids, Mich.

NEW \$5.50 Automatic Adding Machine. Adds, Subtracts, Multiplies. Absolutely accurate. Capacity 2999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates mistakes. Saves Time. Postpaid. \$5.50. Bassett Co., 1458-N Hollywood Ave., Chicago.

PRINTING, ENGRAVING AND MULTIGRAPHING

100 IMITATION typewritten circular letters. 35c, prepaid. Franklin Mercantile Co., Huntington, Pa.

200 HAMMERMILL Notebooks \$1.00, samples 2c. C. C. Press, Box 224, Nashua, N. H.

MIMOGRAPHED letters our specialty. 100, \$1.25. Samples, prices free. Name cards neatly printed, 100, 50c. T. R. Smith, Rolfe, Iowa.

SHIPPING Tag Users—our prices will interest you; write for them. Quality Print, Hudson, Wis.

250 LETTERHEADS or Envelopes, \$1.50; other printing. Samples, stamp. H. Honey, Paris, Mo.

GUMMED labels. Advertising stickers. Catalogue free. Pennell-Standard, Cornington, Ky.

PRINTING AND ENGRAVING

REPRODUCTIONS quickly and clearly printed in black for inventors or Manufacturers of Newspaper articles, typewritten matter, testimonial sketches, and copies of patent drawings. Size \$4.00. One hundred copies \$5. Three hundred \$10. Send money order with copy or stamp for sample of reproductions. Reliable Novelty Company, 600 F Street N. W., Washington, D. C.

100 BOOK-FORM Calling Cards \$1.25. Business size \$1.50. Process engraving and quantity prices on request. Salesman's sample case 20c. Book-Form Card Show, 3461 Clark St., Chicago.

100 BOOK-FORM Cards with case. 85 cents; business size, 300 for \$1.75, postpaid. Artcraft Printshop, 19 Highland Ave., Elizabeth, N. J.

100 BOND Letterheads, 100 Envelopes, \$1.25. Others reasonable. Economic Press, Leona, N. J.

QUANTITY Users save 30%. Wolf Roll Labels, Ste. E, Philadelphia.

PRE-USED Printing Presses, Type and supplies. List for stamp. Popular Bargains, Reidsdale, Pa.

EMBOSS business, personal stationery. Samples, stamp. Daniels Co., Pittston, Pa.

1,000 LETTERHEADS or Envelopes, \$2.00, sent prepaid. Samples Free. Montfort Press, Mountville, Pa.

REDUCED prices for better printing. 1,000 Bond letter-heads, \$5.00; 1,000 gold envelopes, \$4.25; 1,000 four-page folders, 3 1/2 x 5 1/2 inches, \$12.00. Catalogues, circulars, booklets our specialty. All printing at reduced prices. Samples free. Pantur, 825 S. Dearborn St., Chicago.

TWO-COLOR Quality Printing for price of one. Samples, Arrow Print, 231P Walnut, Waterbury, Conn.

1000 FULL-SIZE Hammermill Bond Letterheads \$3.65. Postpaid. Other stationery in proportion. Business building Multigraph letters cheap. Samples free. Charles B. Hatfield, Box 353, Oswego, N. Y.

350 LETTERHEADS, 350 White Envelopes, printed and mailed, \$3.00. Samples printing free. Write Sun, Mahawk, N. Y.

2,000 LETTERHEADS or Envelopes \$7.50 prepaid 5th zone. Samples Free. Quality Printery, Marietta, Ohio.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

FOR MEN

SHAVE with comfort. Flexible Mirror helps wonderfully. Descriptive Circular free. Brandow Company, 270 Atlas Bldg., San Francisco, Calif.

YOUR ounce "Handy" creates smokers in three minutes. \$1 postpaid. Acquaduck Mfg. Co., Portsmouth, N. J.

I WANT to send Free to every chronic pipe smoker in the country a good, big, generous sample package of my pure, sugar-cured, nature-harvest Old Green River Pipe Tobacco. No money to pay. If you are a tobacco crank, all the better. Try the cure first. No scrip, harassing or dope. After you try it free, I'll show you how to cut your smoke bill one-half and get more pipe joy. Just send name and address, and say whether you want mild, medium or strong. Pete Moberly, Box 820, Owensboro, Ky.

RAZORS AND BLADES SHARPENED

TO every reader of Popular Mechanics Magazine we will send one of our patent one-piece safety razors, with three blades, for advertising purposes. Send 25c for shipping expenses. Mellette Razor Co., Room 3, 410 N. Michigan Ave., Chicago, Ill.

BLADES Resharpened 3c, any make. Straight Razors, 50c. Guaranteed Service. Standard Safety Razor Corporation, Pittsburgh, Pa.

BLADES re-sharpened. One edge 2c, double 3c each. Straight razors ground 75c. New York Edge Co., Glen Cove, N. Y.

GUNS, SPORTING GOODS, ETC.

WANTED—Good shotgun and pistol. Barso, 25 Mulberry, N. Y. City.

LUGER and Mauser Pistols; Mauser Sporting Rifles. Circular ten cents. Pacific Sales, Ltd., Moscow, Idaho.

BOATS AND LAUNCHES

16' ROWBOAT—Construction blueprint. 30c. Woo-Sho-U Co., West Market, Detroit, Mich.

"HOW to make your boat leakproof." Send for booklets. L. W. Ferdinand & Co., 152 Kinsland St., Boston, Mass.

TURN your boat into a high speed launch with one of these twelve-cylinder Motors. Displacement 530 cu. in., 32" long, 30" wide, 30" high; 65 h. p. and up. \$285. Can replace standard parts the world over. Triple Block Motor Works, Box 233, Garfield, Wash.

OPTICAL GOODS

ULTRALENS microscope. Patents pending. Magnifies 25,000 times, 75c. Adjustable power model magnifying up to 100,000 times, \$1.50. Others up to 250,000 times. Something new. Circular P-2 free. Specialty Mfg. Co., Milton, Penna.

DIAMONDS, WATCHES AND JEWELRY

MONTANA White Sapphires, very brilliantly cut. 1 carat size, \$2.50; sent C.O.D. Prices on other gems on request. Address F. A. Pribyl, Box 111, Lewistown, Mont.

"BLACK" Opals. Beautiful colors. Australia's National Gem. Lists free. Worldwide connection. Seward, Optician, Melbourne, Australia.

WATCH REPAIRING

I REPAIR American and Swiss finest wrist watches and best grade railroad watches. I positively guarantee first-class workmanship and prompt service. References furnished to anyone interested. Jas. A. Piskin, 181 W. 32nd St., New York.

ANTIQUES AND RELICS

FOR Dime: Guns, pistols, helmets, medals, etc., collected Europe's battlefields. Catalogue and war photos 10c. Lieut. Welsh, 50 Ft. Greene Place, Brooklyn, N. Y.

INDIAN Beadwork and Curios, War-Clubs, Moccasins, Flute Saddle; numerous other articles for collections and dums. F. Hackett, Rushville, Neb.

INDIAN Relics—24-page Catalogue List Free. Grutzmacher, Mukwonago, Wis.

PHONOGRAPHS AND RECORDS

BUILD a genuine Choralphon phonograph and save over half. Big profit building and selling. We furnish motors, tone-arms, full instructions and all necessary parts. Send for catalog and free blueprint offer. Choralphon Phonograph Co., 221 11th St., Elkhart, Ind.

BUILD Best Phonographs. Write for parts catalog and free blueprint offer. American Phonograph Co., 3515 North Crawford, Chicago.

BUILD Your Phonograph. "Perfection" high quality spring and electric motors, tone arms, reproducers, wonderful results. Big saving. New catalog and building instructions mailed for ten cents. Hunter Manufacturing & Supply Co., Phonograph Supply Dept., 313 Baldwin Block, Indianapolis, Ind.

WONDERFUL Bargains in Phonograph Cabinets. Hunter Factory, McHenry, Ill.

MUSIC AND MUSICAL INSTRUMENTS

BAG Jazz Piano Playing Taught in 20 lessons the "Christensen" way. Christensen schools in most cities prefer to your telephone directory, or write for booklet about mail course. Teachers wanted in unoccupied cities. Christensen School, 423, 20 East Jackson, Chicago.

JOIN our Sheet Music Club and receive latest popular music of all publishers. \$1.00 year plan. Write for details. Sheet Music Club, Suite 703, 1543 Broadway, New York, N. Y.

SONG writers—Have you song poems or melodies? I have very best proposition to offer you. Ray Hibberd, D116, 4048 Dickens Ave., Chicago.

EVERYBODY'S Singing. "I Ain't Got Nothing To Give Away." "When You Just Can't Be Glad." Each 10c postpaid. Derrick Music Publisher, 4431 St. Lawrence Ave., Chicago.

POSSIBLY Antonio Stradivari's Seventeen-Twelve Genuine Violin. Write Henry Griffin, Grosse, Texas.

GET the Bohemian imported violins; best grade, pure sweet tone. Peter Bozsk, Box 63, Portland, Ore.

SONG Poems wanted. Clarence Krause, composer and arranger of music, Box 1652, Dallas, Texas.

CORNETISTS—Trombonists—Saxophonists—Clarinetists. Send for "Free Printers." Name instrument. Virtuoso School, Buffalo, New York.

I WANT Song Poems. Casper Nathan, Woods Theatre Bldg., Chicago.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 261 N. Wayne Ave., Chicago.

"MUSIC Composed" in words. Bauer Bros. (formerly of Sousa's Band), Oshkosh, Wis.

PATENT ATTORNEYS

PATENTS Secured. Prompt service. Avoid dangerous delays. Send for our "Record of Invention" form and Free Book telling how to obtain a Patent. Send sketch or model for examination. Preliminary advice without charge. Highest references. Write today. J. I. Jackson & Co., 244 Oursay Bldg., Washington, D. C.

PATENTS—Trademarks. Before disclosing an invention, the inventor should write for my blank form "Evidence of Conception." This should be signed, witnessed and returned to me with sketch or model, upon receipt of which I will promptly render opinion as to patentable nature and send booklet on Patents. Highest references. Prompt attention. Reasonable terms. Clarence R. O'Brien, Registered Patent Lawyer, Woodward Building, Washington, D. C.

PATENTS Procured—Trade Marks Registered. A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing ideas free on request. Richard R. Owen, 26 Owen Bldg., Washington, D. C., or 2176 R. Woolworth Bldg., New York.

PATENTS—Trademarks. Thirty-five years' experience. Send model or sketch for opinion as to patentability. Free "Inventor's Guide." Highest references and personal attention assure best results. Franklin H. Hough, 322 Washington Loan & Trust Bldg., Washington, D. C.

PROTECT your rights. Write for "Record of Invention" which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Rooney Kelly, 612 G. Columbian Bldg., Washington, D. C.

PATENTS—Prompt, personal, efficient service by an attorney-at-law, skilled in all branches of Patent Practice. Over 12 years' actual experience; full information upon request. R. P. Fishburne, 321 McGill Bldg., Washington, D. C.

PATENTS, Trade Marks, Designs and Copyrights. Registered firm of attorneys-at-law. Careful, prompt personal service assured. Moderate fees. Full information free upon request. Griggs & Collings, 406 Oursay Building, Washington, D. C.

PATENT applications filed on partial payment plan. Trade-marks, copyrights, etc. Mills R. Stevens & Co., 685 F St., Washington, 1553 Monmouth Bldg., Chicago. Estab. 1864.

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Continued from Page 48

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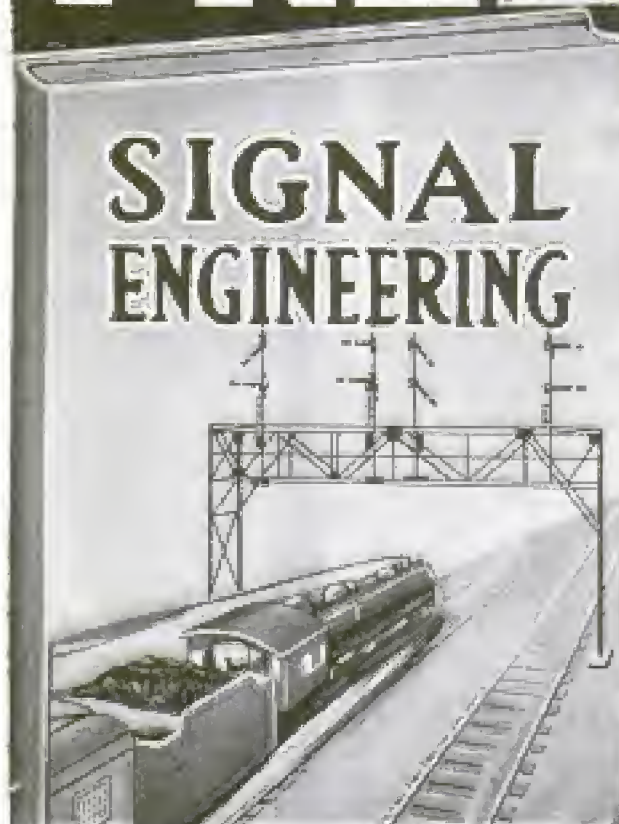
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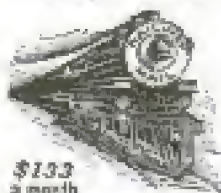
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Read this interesting letter from Lewis A. Boulin. He tells the kind of training you get at this great institution for auto mechanics and electricians and the results of his experience here. I have received hundreds of such letters from our graduates.

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Now in Business for Himself

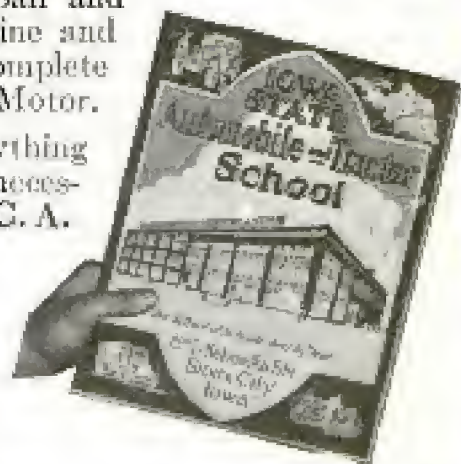
My Dear Mr. Hennessy:

Waterville, Maine.

In the first place I want to tell you how I happened to come to your school. Well, I had a number of catalogs from different schools and yours was the only one that appealed to me on account of the Standard Practical methods which you teach. Again I could have gone to a school much nearer home and saved the extra \$120.00 railroad fare, but I want to tell you that I got more than that amount in just one department alone and the entire course was worth three times the amount I paid.

I certainly appreciated your kindness in securing me a position when I had finished school, and after working there I decided to go in business for myself, for if I can make money for the other fellow, I can do the same for myself. I have a nice Battery and Vulcanizing place here all my own and have all the work I can do. You made this possible for me, Mr. Hennessy, and I want to thank you for the interest you have given me from start to finish. Your friend and student,

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Fully illustrated; shows our students at work. Gives full particulars on what we offer you. Tells all about the big present opportunities in the automobile business. Don't wait a single day. Write for this book at once. Send me a postal or use the coupon.

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"I ALWAYS felt you had it in you to get ahead. But for a time I was afraid your natural ability would be wasted because you had never trained yourself to do any one thing well. Yes, I was afraid you would always be 'a jack of all trades and master of none.'"

"But the minute you decided to study in your spare time I knew you'd make good. You seemed more ambitious—more cheerful—more confident of the future. And I knew that your employers couldn't help but notice the difference in your work."

"Think what this last promotion means! More money—more comforts—more of everything worth while. Tom, those hours you spent on that I. C. S. course were the best investment you ever made."

HOW about you? Are you always going to work for a small salary? Are you going to waste your natural ability all your life? Or are you going to get ahead in a big way? It all depends on what you do with your spare time.

Opportunity knocks—this time in the form of that familiar I. C. S. coupon. It may seem like a little thing, but it has been the means of bringing better jobs and bigger salaries to thousands of men.

Mark and mail it today and without obligation or a penny of cost, learn what the I. C. S. can do for you.

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Without cost or obligation please explain how I can qualify for the position, or in the subject before which I have marked an X in the list below:

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Electric Lighting & Railways
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Telegraph Engineer
Telephone Work
☐ MECHANICAL ENGINEER
Mechanical Draftsman
Machine Shop Practice
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Gas Engine Operating
☐ CIVIL ENGINEER
Surveying and Mapping
MINE FOREMAN or ENGR
STATIONARY ENGINEER
Marine Engineer
☐ ARCHITECT
Contractor and Builder
Architectural Draftsman
Concrete Builder
Structural Engineer
PLUMBING & HEATING
Sheet Metal Worker
Textile Overseer or Engt.
☐ CHEMIST
Pharmacy

☐ BUSINESS MANAGEMENT
SALESMANSHIP
ADVERTISING
Show Card & Sign Pkg.
Railroad Positions
ILLUSTRATING
Cartooning
Private Secretary
Business Correspondent
BOOKKEEPING
Stenographer & Typist
Certified Public Accountant
TRAFFIC MANAGER
Railway Accountant
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Common School Subjects
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Mathematics
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Poultry Raising ☐ Spanish
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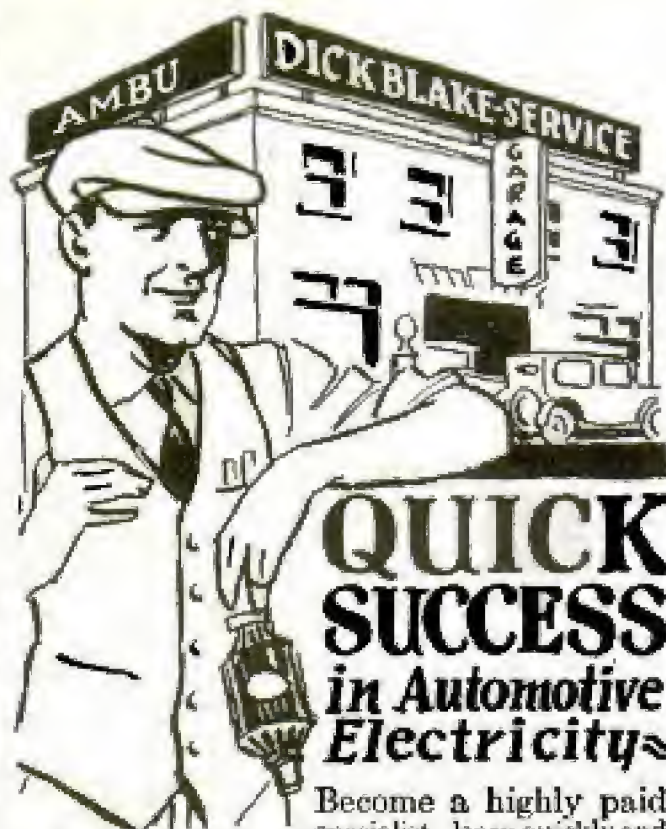
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Street and No.....

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Become a highly paid specialist—learn quickly and easily about Automotive Electricity. Men trained in this branch are scarce and, therefore, well-paid. Thousands of big paying positions awaiting AMBU trained men.

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Great chance to start your own business—little money needed—we train you in spare time at home. Thousands of similarly trained men are drawing big salaries or running their own successful business. You can complete our course successfully even if you now know nothing of automobiles or electricity.

Salaries Up to \$6,000 Earnings Up to \$25,000

Big Corporations pay men who have the equivalent of AMBU training, up to \$6,000 per year. Millions of autos are operated, their owners are ready to patronize AMBU trained men to get expert service in Starting, Lighting, Ignition and Battery. AMBU trained men can earn up to \$25,000 yearly operating such service stations. You can do as well.

Young Dick Blake Earns \$2,600 in Own Business in Six Months

Without previous training or special experience, young Blake earned \$2,600 first six months through AMBU training. We can help you to quick success also—you don't risk a penny. Write for our "Money Back Guarantee Bond" and "Success Book"—free.

MAIL THIS NOW—

get into the Big-money Class—Success Book tells you how.

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Send FIVE your Success Book and complete information. I want to learn how to train for Bigger Money in spare time.

Write Name and Address in Space Below. Tear Off on Dotted Line

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City..... State.....

Are you now in auto business? Yes ☐ No ☐

He thought he could throw me—

Dear Tom: You know how Ted Brown has always been saying he could throw me with one hand tied behind him, if he wanted to. Well, yesterday, he grabbed hold of me and we had it out. Gee, I wish you'd been there. You know how much bigger Ted is than I. He thought he had me licked dead easy—

but

I wriggled around and got a hold on him that I'd learned from the Farmer Burns School of Wrestling. The next second — KRRFLOP, and I had Mister Ted Brown on the ground, yelling for me to quit. It's a cinch to handle a fellow half as big again as you are if you know the secret holds. If I were you I'd write to Burns School for their free book about wrestling. So long—FRED.

Learn Wrestling Secrets from Worlds Champions Farmer Burns and Frank Gotch

Learn the marvelous holds, breaks, blocks and tricks that will enable you to handle big, strong men with ease. The renowned FARMER BURNS—"father of scientific wrestling"—and FRANK GOTCH the world's champion, have prepared a series of lessons in which they reveal the inside secrets of training that will make YOU, too, an expert wrestler. All the great secrets of self-defense and jui-jitsu illustrated by printed word and picture. The lessons teach you how to become a great athlete, and secret knowledge enabling you to throw boys and men larger and stronger than yourself.

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Our FREE ILLUSTRATED BOOK tells you all about the advantages in health, vigor and respect that being able to wrestle brings one. It tells you how to learn to become a skilled wrestler in your spare time. Brim full of interesting information about wrestling. Also lots of pictures. INVESTIGATE. Write today for this free book. No obligations. Tear out and mail coupon NOW!

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Omaha, Neb.

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Age

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Thousands have done it through the Roth Memory Course in seven easy lessons. Be able to remember names, faces, numbers, dates, appointments, speeches, etc., on the instant. Examine the course free for five days, then decide. Price \$3 if you keep it. Otherwise no obligation. Write today to Independent Corporation, Dept. R452, 313 Sixth Ave., New York City.

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To make money, get into a field where money is made—and men are wanted. Today there is such a field—a big, profitable field that has been barely scratched. Men are succeeding in it and making money and uncounted opportunities for great success are still open. The Finger Print profession is the field that offers you this opportunity. Finger Printing is beyond the experimental. It is recognized as the one positive means of identification.

Be a Finger Print Expert

Finger Print Experts earn big money and occupy the respected position of the professional man because their work is conspicuous and essential. There are no lay-offs nor shut-downs in the Finger Print profession. Everything you do counts for yourself. Daily, just a handful of men are trying to answer the demands of thousands and thousands of instances where the Finger Print Expert is vitally needed. Trained Finger Print Experts share in big incomes, fame and importance. For years my time has been devoted to the Finger Print profession. I will teach you how to become a Finger Print Expert. My course of study is simple, easily understood and I guarantee to assist you in securing a position. Read the letter from the Phillip State Bank. You can study during your spare time. No special education is needed. My simplified course makes everything clear.

Secret Service Course

In addition to my complete course in Finger Prints, I will also supply you free and without extra charge, a complete course in Secret Service. Study of this will equip you for all-round work. It gives you knowledge essential to the successful Finger Print Expert. Remember this course is free with my course in Finger Prints. It, alone, is worth the cost of my complete course in Finger Prints. But this offer, as is my Position offer and Free Professional Outfit offer, is limited. Men are needed at once. Unless you act at once, you may lose this remarkable free offer.

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FREE To all who write for complete information at once, I will send, Free, copies of actual Secret Service reports. These reports give inside facts of amazing cases of interest to you. Send for them and my complete explanation at once. I will tell you fully what you can expect as a Finger Print Expert and I will help you succeed. Today—write for this information and my guaranteed-position offer.

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Clears Your Skin

of Pimples, Blackheads, Acne Eruptions, Enlarged Pores, Oily or Shiny Skin? *Elegant after Shaving.* Indispensable for sensitive, refined women.

GUARANTEED to banish unsightly blemishes easily and quickly, and leave the skin clear and smooth.



"A Clear-Tone Skin"

This Free Booklet tells how you can easily and quickly at home obtain a clear skin, free from all blemishes, like Nature intended you to have. Thousands of copies of this interesting book distributed monthly.

Clear-Tone is not a cure-all or a mail-order treatment, but a scientific, reliable SKIN LOTION, perfected after 15 years personal experience by Mr. E. S. Givens, who knows every embarrassment one has to suffer with a bad complexion. Endorsed and prescribed by physicians, druggists, and thousands of enthusiastic users, and sold on a direct and positive guarantee of absolute satisfaction or money back! The marvel of Clear-Tone is that it clears the complexion so quickly, no matter the cause.

Clear-Tone has had an unprecedented success as evidenced by the thousands of voluntary letters written by men and women who had very bad blemishes and tried various soaps, cosmetics and doctors without relief.

READ THESE LETTERS!

From U. S. Hospital: "Find myself improving wonderfully. Anyone I see that has skin trouble your wonderful Clear-Tone will be recommended." U. A. Heim, U. S. Hos. 41, Sta. Island, N. Y.

From a Barber: "Have been a barber for 20 years and never saw anything as good as Clear-Tone. All barbers should know about it." Otto Van Hurin, Kansas City, Mo.

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From a Lady: "I cannot thank you enough for all the good it has done me. One bottle has cleared my face wonderfully." Miss Mary Yonka, Haverstraw, N. Y.

From a Soldier: "It is certainly wonderful." Louis Langer, Troop F, 3d Cavalry, Ft. Ethan Allen, Vt.

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Thousands of Others:—men and women—praise Clear-Tone. We'll gladly send copies of most interesting testimonials.

FREE! Simply send name today for FREE booklet, "A Clear-Tone Skin," telling how I cured myself after being afflicted for 15 years, and my \$1,000 guarantee to clear your skin of the above blemishes. E. S. GIVENS, 128 Chemical Bldg., Kansas City, Mo.

YOUR Opportunity

to land a Man's size job at \$35 to \$100 a Week

Ask yourself three simple questions:

Am I Satisfied With My Present Salary?

Am I Satisfied With My Present Occupation?

Am I Satisfied With My Future Prospects?

The Chance of a Lifetime

Be square with yourself now—it's **your** welfare we're talking about. If you're not satisfied this is the chance of your lifetime to do what thousands of other men, like you, have done and to quickly get into this big field of attractive salaries, congenial occupation and unlimited opportunity for further advancement.

One of our students rose in 8 months from a struggling farm laborer to a man's sized job as Draftsman with an Engineer in California. He has since stepped up to a bigger Drafting job with large Western Iron works.

Other Men Like You Getting \$35 to \$100 a Week

David Jacques was promoted from Draftsman to Assistant Plant Manager at a handsome increase in salary.

W. N. Busey was a clerk in a store. Today he's a Draftsman in one of the country's largest organ works. Verne Hornback was an apprentice machinist. When half through the Columbia course he was promoted to a Draftsman at \$45 a week.

Alan Ward rose from tape machine operator to Assistant Chief Draftsman before he finished the Columbia course.

J. P. Finkbone received two salary increases in nine months after completing the Columbia course.

No Previous Training Necessary

These aren't exceptional cases. Hundreds of Columbia men have done as well or better. The booklet I will send you tells about many of them. You can do just what they have done. All you must do now is to take advantage of this opportunity—the same opportunity they grasped. No matter who you are, where you live, what you are now doing or have done—even though you don't know a drawing board from an ironing board—though you are just an ordinary man, like Berger and Busey and the rest, we'll train you in your spare time at home by mail, so that in six to ten months you will be a practical, professional Draftsman, ready to take a man's sized job at an expert's pay. You'll learn Drafting work by making Mechanical Drawings—not by merely reading how it should be done.

Everything Furnished

You will be given **FREE**, a complete Mechanical Drawing outfit and a professional set of highest grade Drafting instruments to use throughout the course and after you become a Professional Draftsman.

Help in Getting a Position

You will be given the services of our Student's Employment Bureau in helping you to secure a position as Draftsman at good pay. We've helped hundreds of our graduates to excellent positions with many of the country's largest concerns and we're continually receiving requests for Columbia graduates.

Advancement to \$15,000 a Year or More

You'll find Mechanical Drafting the greatest game you ever tackled. It's one job you can put your heart into because each day's work is more and more fascinating and your opportunities for advancement never cease. You start in at more than the average man earns at ordinary work. From that it is just a few short steps to Assistant Chief Draftsman, then Chief Draftsman, Engineer, Production Manager, Plant Manager, and so on—positions that pay \$6,000 to \$15,000 a year and

more. Don't let figures scare you. You can do it, man, as others have done, if you make Mechanical Drafting the stepping stone. Don't think you can't but **know** you can because others have done it.

Send Coupon for Free Booklet

Fill in the attached coupon and send it to me. I will send you an interesting booklet, "Your Future in Drafting" and a copy of "The Compass"—telling how easy it is for you to take advantage of this opportunity. Do this **right now**.

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Columbia School of Drafting

Department 1630

Washington, D. C.

Roy C. Claffin, Pres.,
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Tell me how Columbia training will help me and send me your booklet, "Your Future in Drafting" and a sample copy of "The Compass"

Name

Address

City State



Tobacco Is Hurting You

Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For you know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but sure.

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco has undermined your system.

When your hands begin to tremble—
and your appetite begins to fail—
and your heart seems to "skip a beat" now and then—
and slight exertion makes you short of breath—
then you have a right to suspect that
TOBACCO is getting the upper hand.

Any well-informed doctor will tell you that these are only a few of many symptoms of tobacco poisoning.

And YOU know that the use of tobacco in any form is an expensive, utterly useless habit. You know you ought to quit.

Tobacco Habit Banished

Let Us Help You

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

It is in no sense a substitute for tobacco. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves and make you feel better in every way.

Results Guaranteed

As a single trial will convince you. Our legal-binding, money-back guarantee goes with each full treatment. We will refund every cent you pay for the treatment if after taking it according to the easy-to-follow directions, it should fail to banish the tobacco habit completely.

SEND Free Proof

Let us send you our free booklet on the deadly effects of tobacco, together with testimonial letters from men all over the country telling how they have been absolutely freed from the tobacco habit by this simple home treatment. You could not ask for stronger proof that **Tobacco Redeemer** will free you from the habit than the evidence we will gladly send on request. Just mail the coupon—or a postal will do.

NEWELL PHARMACAL CO.

Dept. 300

St. Louis, Mo.



Free Book Coupon

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Name

Street and No.

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FREE



Everything used by expert draftsmen given you absolutely free. Outfit includes "professional" complete set of fine drawing instruments with double set of compasses and dividers all in velvet lined case, Drawing board, T square, two triangles, protractor, universal curve, triangular, standard scale, waterproof ink, pens, pencils and all accessories—furnished you free in this expert's complete outfit.

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Mail this coupon for our interesting book, "Drafting the Foundation of Industry," sent you free. It explains all about the Coyne home study method and shows you how to become a draftsman in the rightest and easiest way. You want to know all about this great institution. Don't put it off. Send for this book now. It's absolutely free, no obligation. It contains the most valuable information you will ever get in your life. Send the coupon now.

Check coupon below and mail now!

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Department 1772 39-51 E. Illinois St., Chicago, Ill.
Dear Sirs:—Please send me, absolutely free, without obligation, your book, "Drafting the Foundation of Industry," also full information about the Course in Drafting. (Check which course you prefer)
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ARE you fond of outdoor work? Would you like to become a Civil Engineer? Then take up Surveying. It is a profession that not only pays big salaries itself, but it is the stepping stone to something even better. Probably 99 out of every 100 Civil Engineers were surveyors first.

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| <input type="checkbox"/> ARCHITECTURE | <input type="checkbox"/> Railway Mail Service |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Pharmacist |
| <input type="checkbox"/> Stationary Engineering | <input type="checkbox"/> Traffic Manager |
| <input type="checkbox"/> CHEMISTRY | <input type="checkbox"/> Business Management |
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Be an Expert Repairman on Motors and Generators



Repair men are in big demand—particularly men expert in armature winding. Get into this well paid line.

Learn in 3 Months

—to master this work and insure yourself a permanent income and bigger opportunities—here at this Great Electrical School. In this short time you learn the theory and actually wind all types of D. C. and A. C. Armatures under expert instructors.

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Recognized Quality — Tremendous
enduring power, and long years of practical experience, result in a better and higher quality supply at big savings prices. These, Cumpack Co., of Indianapolis, write: "We offer you the highest recommendation for your goods."
Write for our new 1922 catalogue. It's FREE.

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Palmolive Shaving Cream gives a soft, creamy lather that makes the beard wax-like. The razor moves smoothly. Palmolive is also a lotion. Contains both Palm and Olive oils. Write for free trial tube. Large size 10¢, 25¢, 50¢.

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LEARN JUIITSU SECRETS IN 1 HOUR

Capt. Smith's famous army Juiitsu course—now open to civilians—enables you quickly and easily to master Juiitsu IN YOUR OWN HOME.

World's Most Effective Defence

The most formidable holds in existence can now be easily learned. With Capt. Smith's Japanese secrets, you can master an assailant twice your size INSTANTLY. Around these Juiitsu Tricks, Capt. Smith has developed a system of exercising, which as a body-builder and conditioner, has not been equaled in the army or out of it.



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The Master Secret of Juiitsu

So efficient is Capt. Smith's course that children can learn and practice his tricks without personal instruction. This is made possible by Capt. Smith's wonderful discovery of The Master Secret of Juiitsu—The Stahara. Ten years as wrestler and instructor of Juiitsu in Tokyo, Japan, Capt. Smith not only mastered the science, but unearthed the source of the mysterious power of Juiitsu. This secret you can learn and apply IN ONE HOUR. Once mastered, you can become expert in Juiitsu in an amazingly short time.

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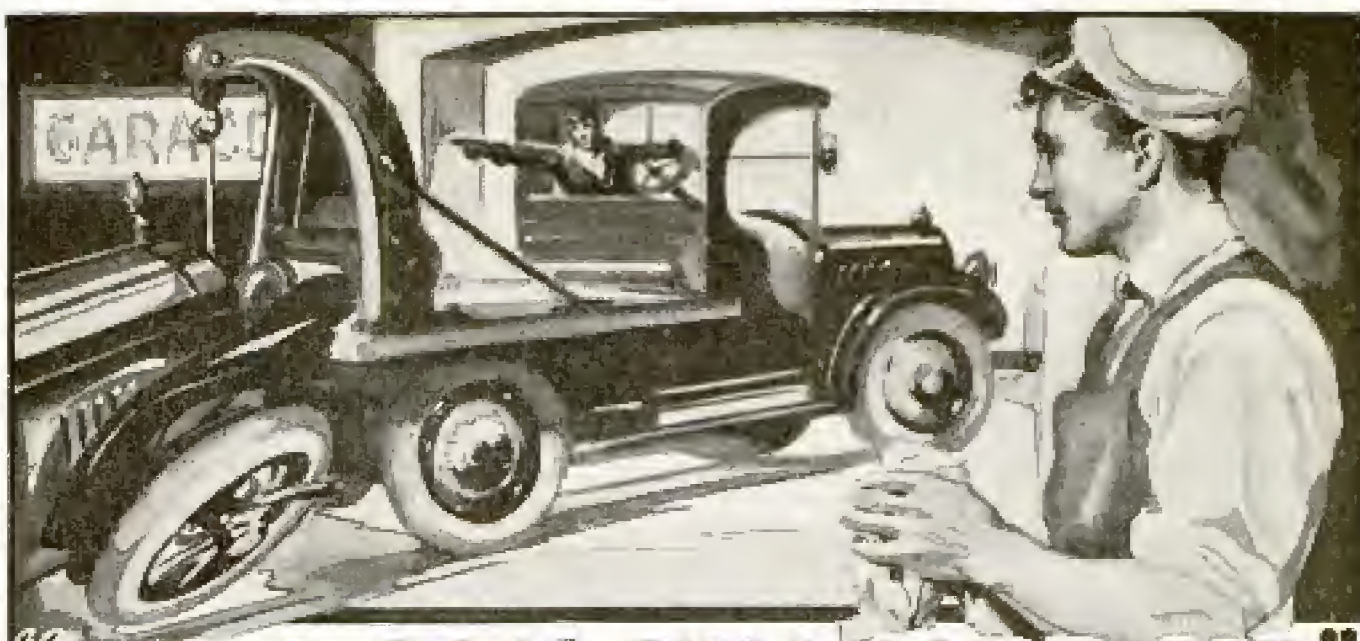
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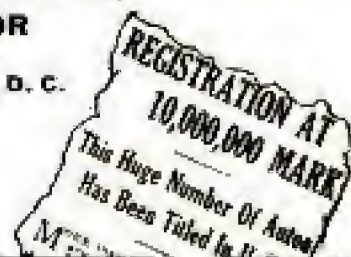
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☐ Business Management
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☐ Good English
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☐ Mathematics
☐ Common School Subjects
☐ MECHANICAL ENGINE
☐ Mechanical Draftsman
☐ CHEMIST

☐ ELECTRICAL ENG'G
☐ Tool Maker
☐ Gas Engine Operating
☐ Telegraph Engineer
☐ Telephone Work
☐ Railroad Positions
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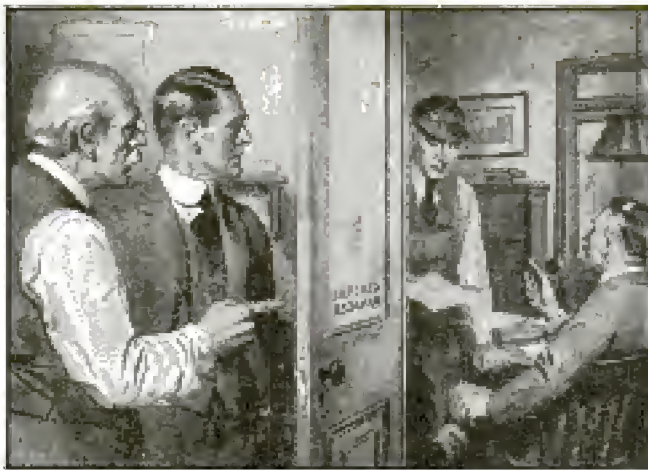
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☐ **CIVIL ENGINEER**
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have spent on my guitar and study-
ing the lessons. I think you have a
wonderful method of teaching as I
have enjoyed the lessons from the
first to the last.

Yours truly,
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I thought I would write a few lines
to you for fun. I am getting along
fine with my guitar. I think, and I am
sure that I am to you for it.

I have some friends that are inter-
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they want one. What shall I do—send
in their address?

Well I haven't much time to write
as much as I would like so I will have
to close.

Yours truly,
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Electric, Texas.
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I have gotten much pleasure from
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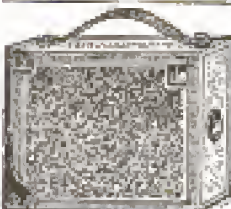
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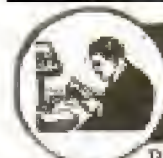
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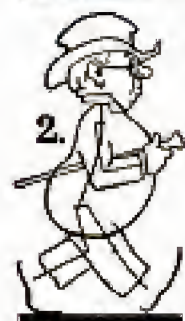
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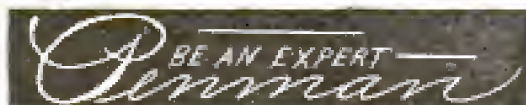
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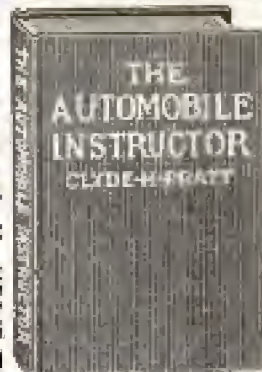
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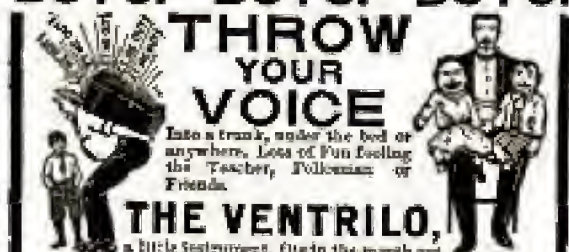
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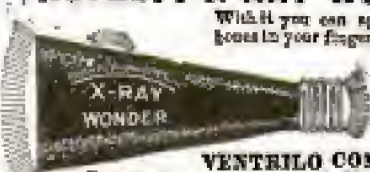
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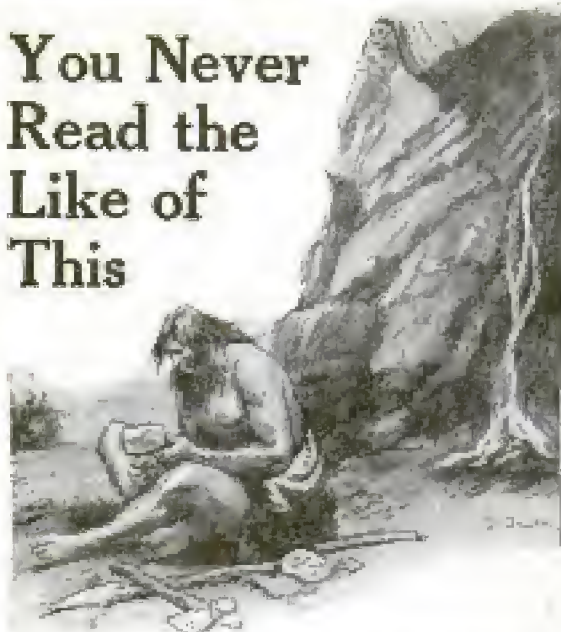
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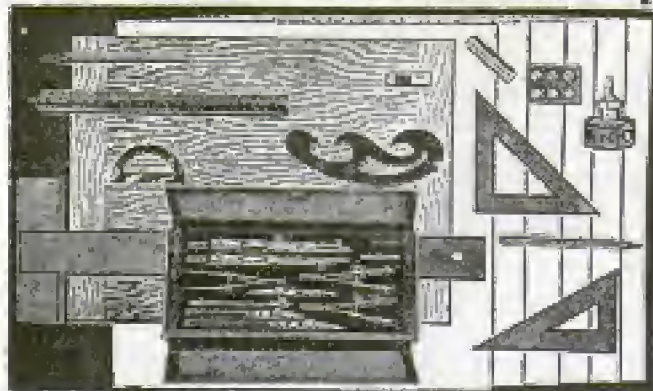
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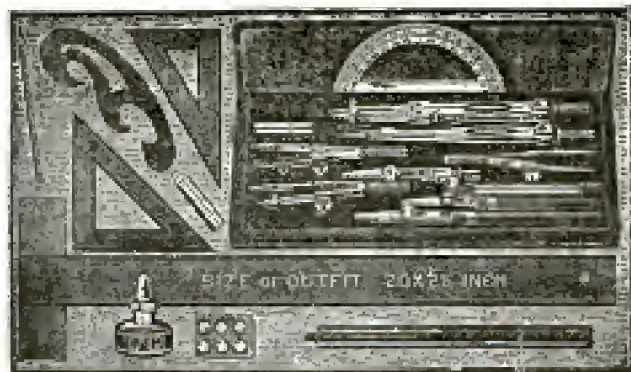
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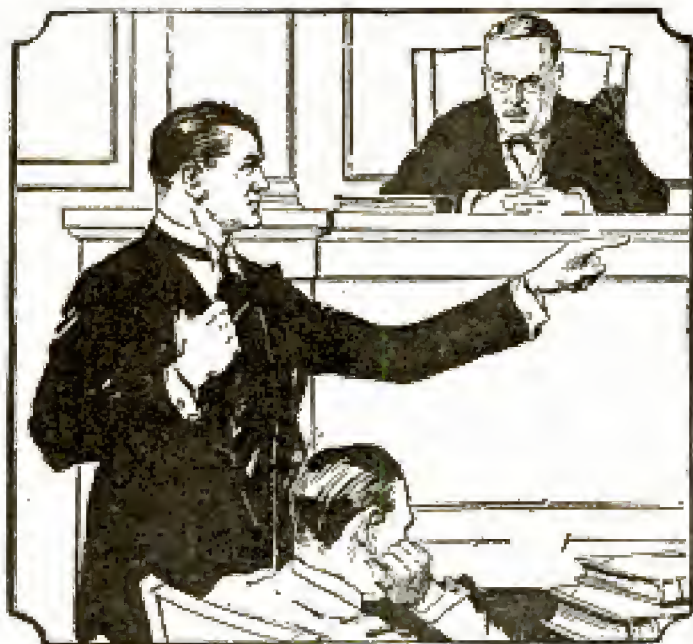
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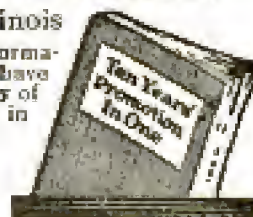
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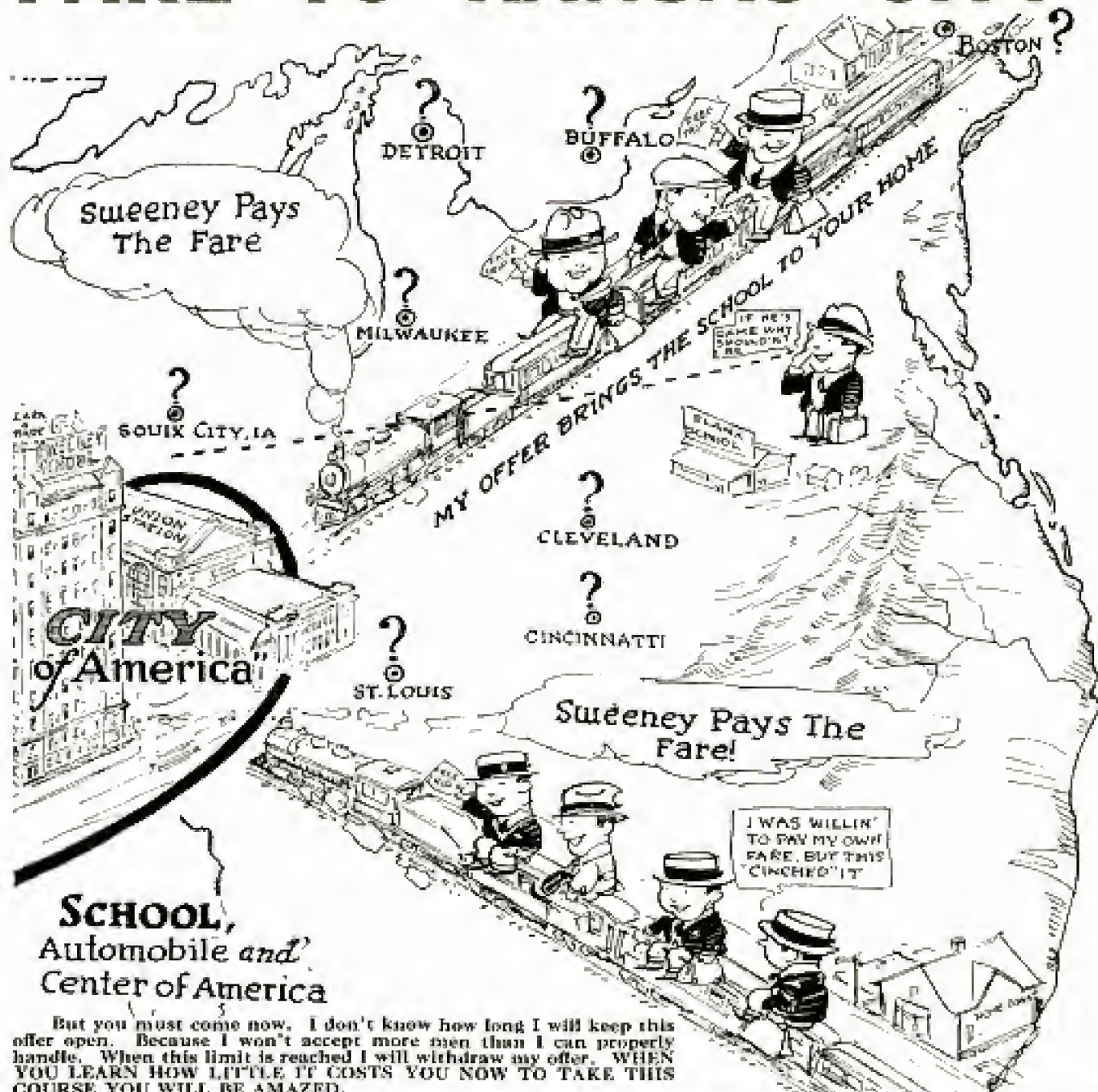
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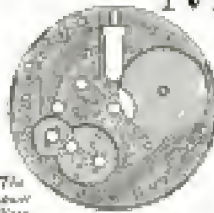
SEE SWEENEY DOUBLE-PAGE SPREAD ON PAGES 18 AND 19

THE SCIENTIFICALLY BUILT WATCH



PERFECTION

MAN'S achievements are intensified by machinery. We travel by machinery on land and sea and in the sky. A machine makes possible your morning newspaper. Would you know the correct time, a marvelous machine informs you, instantly.



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Waltham Colonial A

Extremely thin in its service of accuracy
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WALTHAM

THE WORLD'S WATCH OVER TIME

Where you see this sign they sell Waltham Watches

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Vol. 37

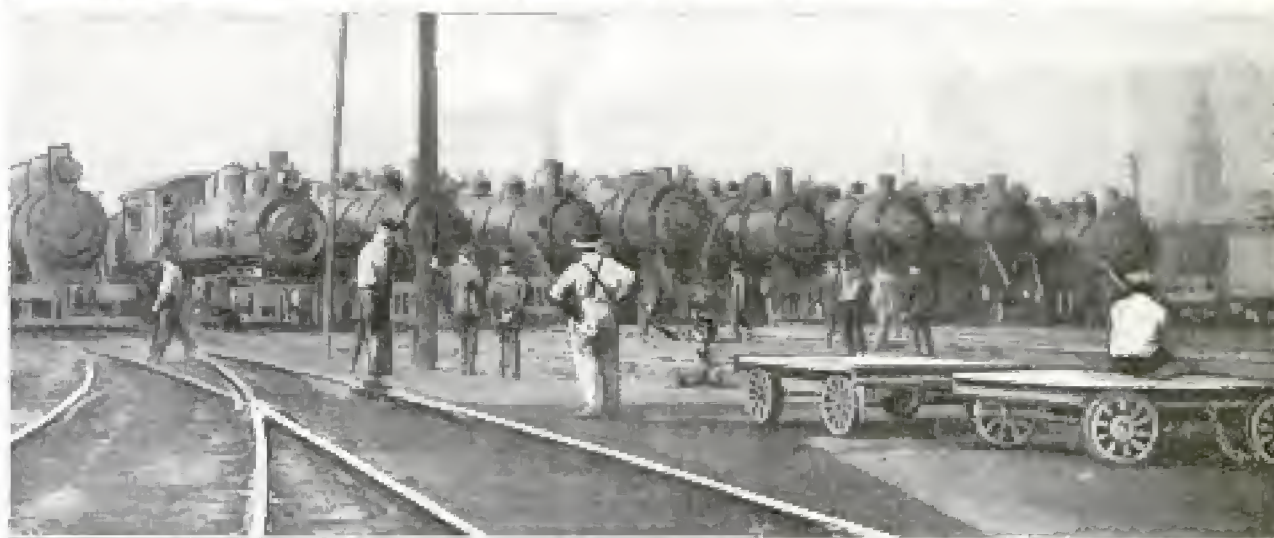
FEBRUARY, 1922

No. 2

7801 Smokiest Locomotives Made Smokeless

A PICTURE taken before and another taken after the application of a remedy are common in connection with advertised nostrums, but quite unusual in the matter of mechanical improvements. Probably for the first time in the history of railroading two pictures of this kind—and moving pictures at that—were taken

of 50 locomotives lined up in the Baltimore and Ohio Railroad yards, at Cincinnati, the first one showing the locomotives belching from their funnels dense clouds of smoke, and the second one, after the application by the engineers of smoke consumers, showing an almost total absence of smoke of any



The Upper Picture Taken before, and the Lower One after, the Application of Smoke Consumers by the Engineers on 50 Locomotives That were Lined Up in the Yards of the Baltimore and Ohio Railroad, at Cincinnati, for the Purpose of having the Great Difference Shown Photographically

*Baltimore + Ohio Railroad Yards
200 of Evans St Cincinnati, Ohio*

J. O. Chickman Jan 16, Station 7 Cincinnati, Ohio

Copyrighted material

kind. It was a contrast equivalent to the difference between day and night. Smoke consumers on the locomotives are compulsory on all trains entering Cincinnati. It has been demonstrated there that they

result not only in smoke prevention, but also in fuel economy. The moving pictures of this demonstration will be shown all over the country as propaganda in the interests of smoke prevention.

BANJO FOR DANCE ORCHESTRAS THROWS SOUND FORWARD

A new banjo is specially designed to meet the requirements of dance orchestras, stage performances, and playing in large halls. The sound from an ordinary



Left: Banjo with Sound-Throwing Horn. Right: Outer Sounding Board Removed from Instrument to Show Construction

banjo is thrown back from the head against the body of the player and much of it is deadened in this way. The new banjo has a wooden sounding board set just back of the head. A horn, opening from the space between the head and sounding board, passes through the frame of the instrument and throws the entire volume of sound forward into the hall. A second board covers the back of the instrument. This not only increases the volume of sound but, by variations in construction, the quality of tone can be controlled to suit special purposes.

RABBITS AS A PROTECTION FROM MOSQUITOES

Careful observations have been made in France, of the extent to which mosquitoes are attracted to domestic animals in preference to human beings. It was proved experimentally that mosquitoes have a strong predilection for the blood of rabbits, stronger than for that of any other domestic animal. This discovery has been practically applied in many parts

of France as a protection from mosquitoes, and particularly from those that carry germs of malaria, and similar diseases. In many parts of France now the inhabitants raise rabbits in conjunction with poultry, and thus protect themselves profitably against the dangers of disease-bearing mosquitoes.

CLEVER RESCUE OF WORKMAN MAROONED 150 FEET IN AIR

While repairing, single-handed, the top of a smokestack, 125 ft. above the roof of a 30-ft.-high building in the plant of the American Bridge Company, Chicago, the workman let drop the line which was his only means of returning to the roof, and thence to the ground. There was no possibility of conveying a line to that height with any appliance in the plant, and so appeal was made for help from the fire department, which has a line-throwing gun, in appearance exactly like a military rifle, for use in such an emergency. Several futile attempts were made to fire the line within reach of the marooned workman, and finally this method of rescue had to be abandoned. Fortunately, as the stack had not been in use, it was cold, and finally a fellow workman climbed from the level of the roof up the first 30 ft. of the inside of the stack, to which height it was lined with asbestos. On a 3-in. steel ring, on top of the asbestos, the rescuer stood, with his legs astride the stack. In the meantime some long, light wooden scantlings, that had been cut and drilled for templates, as used in all structural work, were obtained and passed up to him. He pushed upward, first one of these scantlings, to the top of which a line was made fast, and to the bottom of that scantling he attached, with the aid of the hoist, another, and so on, scantling after scantling, until the top one came within reach of the stranded workman. This did not happen until the poor fellow had spent four hours in his perilous position, 150 ft. above ground, in the frosty December atmosphere. Once he grasped the end of the line, it was a matter of only a few minutes before he had hitched it to the top of the stack, and slid down to safety.

La Nature 12/3/21

7955-

International, Chicago
Chicago Herald + Examiner

Dec 5, 1921



Roy Sutton, Who was Marooned for Four Hours on Top of the Smokestack



First Attempt of Rescue by Means of a Line-Firing Gun: The Range Was Too Long. However, To the Right is Shown the Subsequent Rescue by Earl Olson, a Fellow Workman, Who Attached One Length of Wooden Scantling to Another until the Top One Carried a Line within Reach of the Stranded Man

95 FEET

ASBESTOS LINING

one. norson into compass
P. P. Norson, South Bend, Ind.

164

info.

POPULAR

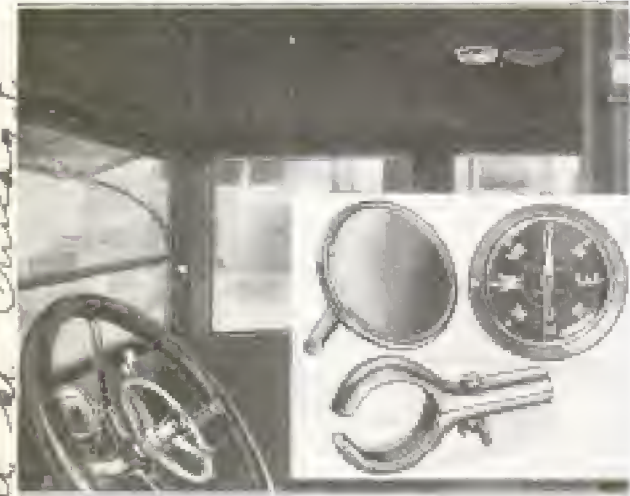
MECHANICS

Christian Science Monitor 9/30/20

COMPASS MOUNTED IN TOP OF AUTOMOBILE

7793

Though marine compasses have been successfully used on automobiles, difficulty has always been experienced in installing



The Compass is Mounted in the Top of the Car and the Mirror on the Steering Column. The Separate Parts are Shown in the Insert

a compass in such a way that it would not be affected by the engine or other steel parts. A special automobile compass has now been developed which overcomes this difficulty. It is attached to the top of the car, about 24 in. back of the windshield and over the driver's head. A small mirror is mounted on the steering column in such a position that the driver can see in it the compass dial and read it without moving his head.

HISTORIC DOCUMENTS PLACED IN LIBRARY OF CONGRESS

The original manuscripts of the Declaration of Independence and the Constitution of the United States were recently removed from the State Department building and placed in the Library of Congress. The fireproof building and special facilities of the library make it

"FLYING AUTOMOBILE" IS FOLDING-WING BIPLANE

At the annual Aero Show, in Paris, France, a new airplane was exhibited which has been popularly termed the "flying automobile." It is a biplane with folding wings and an auxiliary motor. The wings are hinged to the fuselage and fold back, along each side of it, in much the same way as the wings of some of the American folding planes. With the wings folded, the machine is about the size of a

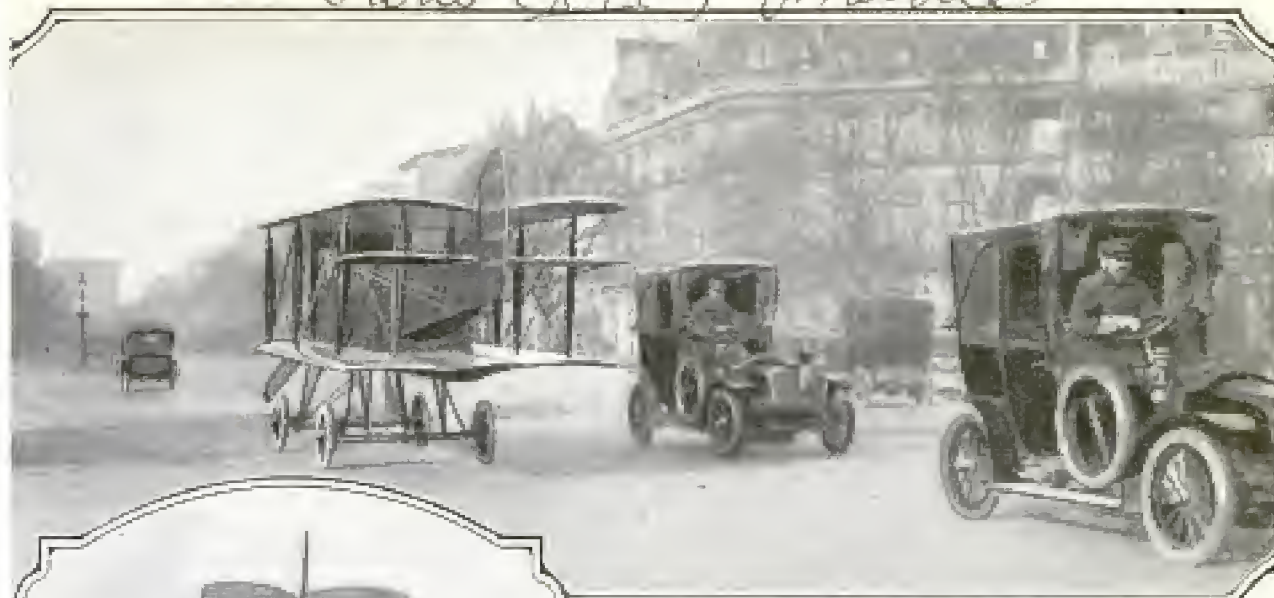
DOLLS AND ANIMAL TOYS, MADE FROM OLD INNER TUBES

One day a New Orleans business man was looking at a pile of worn-out inner tubes, but he was thinking of his baby and an idea occurred to him. With a pair of scissors, a bottle of rubber cement and a pen and ink, he soon converted the old tubes into dolls and animals. The baby thought they were the finest toys he had ever seen, and all the neighbors' babies agreed with him. Before long a small factory had to be built to supply the demand for the rubber toys, and the designs were copyrighted.

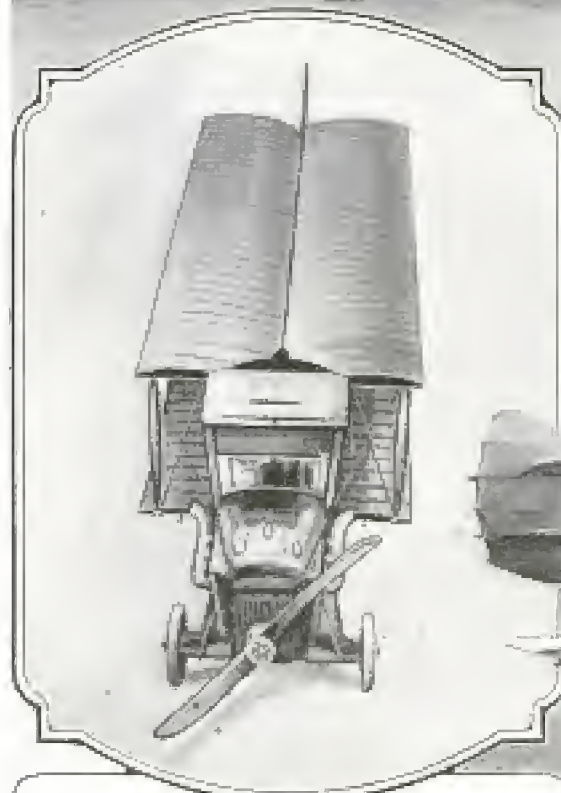


Some of the Toys, Made from Old Inner Tubes, Which are Becoming Popular for Babies

Ans. J. B. Peddicord, New Orleans, La.

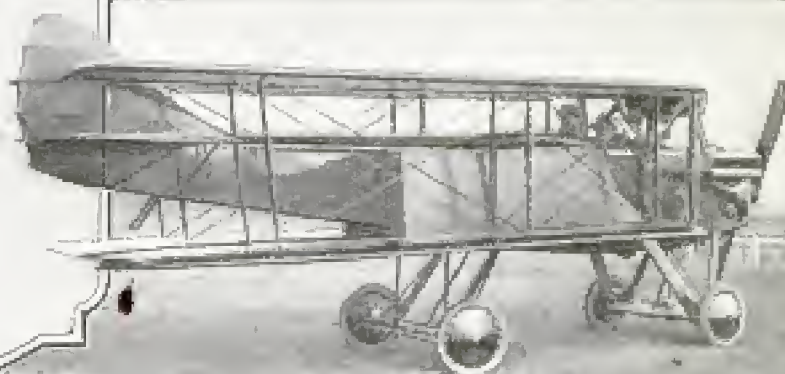


The New Campier Biplane, the French "Flying Automobile," on the Avenue des Champs Élysées, in Paris: This Photograph Shows How the Machine, with the Wings Folded, Compares in Size with Ordinary Automobiles. Below: A Side View, Showing How the Wings Fold Back along the Fuselage



PHOTO, LINDENBROOK & CO. NEW YORK

From Above, the Airplane, with Its Wings Folded, Looks Very Much like a Big Motor Truck or Bus, and It Requires About the Same Storage Space. When It is Run on the Ground, the Power is Furnished by a Small Auxiliary Motor



With the Extra Wheels Removed and the Wings in Normal Position, the Machine Is an Ordinary Biplane, with Nothing to Distinguish It from Other Planes of the Same Type

I no. Potter Bucky,
New York Diagnostic Clinic
 166 **POPULAR MECHANICS'**
 7849 *New York City*

LEAD DIAPHRAGM IS USED WITH X-RAY APPARATUS

Although it is not generally known, the accurate photographing of stout persons with X-ray apparatus has heretofore been



This Concave Lead Diaphragm Eliminates the Secondary Rays When a Stout Person is Photographed by X-Rays

a somewhat difficult task. The reason for this difficulty is the presence of secondary rays which make the plate "cloudy" and which are caused by the thickness of the patient's body. A new diaphragm composed of lead grids is now available, the use of which entirely eliminates these annoying rays. Thus the picture of the fleshy individual can be made as clear and well defined as that of the most frail subject.

SEEDLESS GRAPES IN EASTERN AND NORTHERN STATES

Considerable work has been done by the director of the New York Botanical Garden, in coöperation with the State Experiment Station at Geneva, in connection with the development of seedless grapes for the northern and eastern states. Plantations have been made in the Botanical Garden, and some have already borne fruit. Cuttings of others have been sup-

plied by the State Experiment Station, and from the Experiment Station of California, cuttings of all the most important of the Vinifera grapes have been obtained and are now growing in a nursery. Later these are to be planted in a vineyard, containing specimens of wild grapes, the principal cultivated varieties hardy to that section, and several varieties of the Vinifera, which can be grown there successfully by providing protection in winter. Critical studies will then be made of these plantings.

BILGE STATIONS TO PREVENT POLLUTION OF HARBORS

It has been proposed, in Baltimore, to establish two bilge stations in Chesapeake Bay, one to be utilized by incoming, and the other by outgoing ships, with the object of preventing the pollution of the bay from oil in bilge water. It is claimed that bilge water is now killing fish, oysters, and wild fowl by the thousands. Similar stations are operated successfully in New York. It is estimated that each station would cost about 50,000 dollars.

Christian Science Monitor
TIRE PUMP AS AN ACCESSORY FOR LOW-PRICED CARS

As a standard equipment of an automobile a power-driven tire pump has long been in use on many makes of higher-priced cars. There has now been developed a power-driven tire pump that is available as an accessory for low-priced cars. It is a combination of tire pump and radiator fan, replacing the standard fan and bracket assembly. A simple clutch throws the tire pump into or out of operation. The pump is of the piston type, and it is driven by a disk crank connected with its fan pulley.



A New York City cigar store has a series of humidior compartments built into one wall. When a customer buys a box of cigars, he is given the only key to one of these compartments, and may keep his cigars in it as long as they last.

N. Y. Times 12/13/21
P. 33

A. D. H. d no. 1352 Jackson St Boston, Mass



The Alaskan Whalers Sailing for Home with the Captured Mammal in Tow: This Remarkable Picture was Taken at Night in the Light of the Midnight Sun

WHALE HUNTING ON THE TOP OF THE WORLD

BY LAWRENCE WILLIAM PEDROSE

*Henckley Bldg
Seattle, Wash*

ON the shore of the Arctic Ocean at the extreme northern point of Alaska lives a tribe of Eskimos who are declared to be the greatest whale hunters in the world. These hardy natives brave the dangers of the Arctic seas in open boats, skirting treacherous ice floes, facing deadly blizzards in search of game, which they often pursue scores of miles from land.

Whales are hunted in the Arctic in May and June, when the ice fields have broken up and swept southward into Bering Sea, and again in September, before

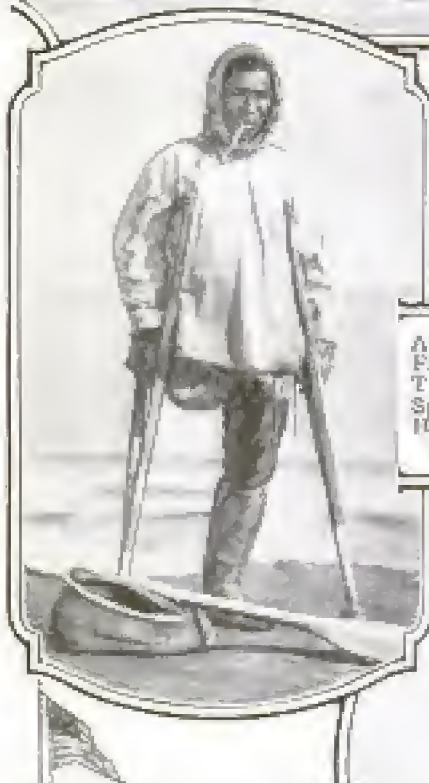
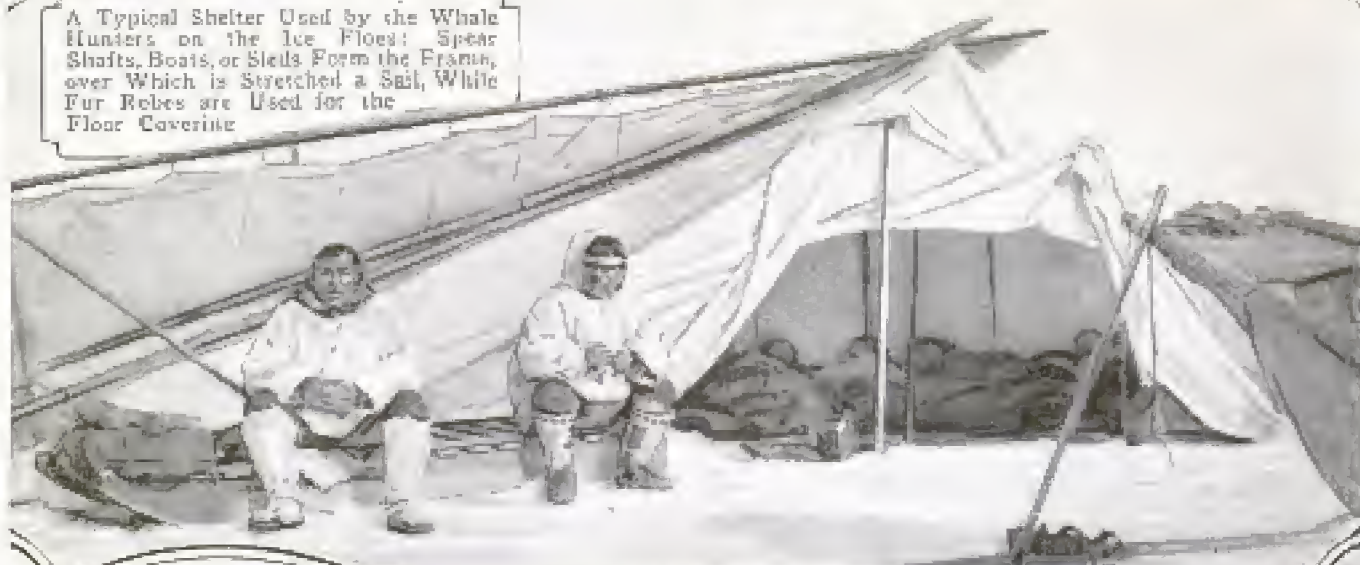
winter seals the ocean with its impenetrable cap of ice. The mammals enter the extreme northern waters when the ice goes out in the spring, and stay until the ice returns. But the Eskimo pursues the whale when it appears early in the season, then turns his attention to seal and duck hunting, returning to the hunt for the mammals in the fall to fill his larder for the long winter.

The Eskimos of the Arctic have strange customs. It has proved difficult to convert them to the ways of the white man. Of the practical arts of the latter, the

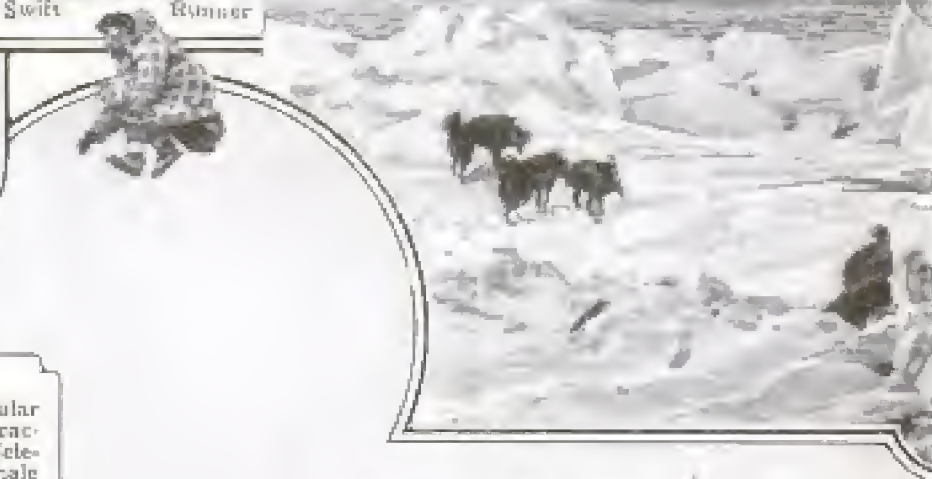


The Whale Hunters Making a Temporary Camp upon the Ice: These Camps Are Necessary, as the Hunters must Be near the Open Water

A Typical Shelter Used by the Whale Hunters on the Ice Floes: Spear Shafts, Boats, or Sleds Form the Frame, over Which is Stretched a Salt, White Fur Robes are Used for the Floor Covering



Anga-Took-Sanga, a Famous Arctic Hunter: This Native Has Steel Spikes in His Crutches. He is Said to Be a Very Swift Runner



Blanket Tossing, Which Is a Popular Sport with the Eskimos and Is Practiced during the Na-mu-ka-tak, or Celebration Following a Successful Whale Hunt: Young Women Are the Best Jumpers, Often Going 30, or 35 Feet into the Air





Dragging the Great Slabs of Whale Meat Ashore: All the Men and Some of the Women and Children of the Tribe are Required to Lend a Hand. Salvaging of the Meat is Followed by a Great Feast, Dance, and Distribution of the Prize



Tak-Pak, Champion Whale Hunter of the Arctic: Last Fall Tak-Pak Killed Seven Huge Whales between the Alaskan and Siberian Coasts



The Start upon the Whale Hunt in the Early Morning: In the Distance is Seen Bleak Diomedede Island. This Picture Tells Graphically the Conditions under Which the Eskimos Hunt Whale



A Whale is Struck and the Lucky Boat Hoists Its Flag as a Signal to the Other Boats to Hurry to Its Assistance. Generally the Mammal has been Killed by the Time the Other Whalers Come Up

natives have adopted whale boats and firearms. The methods of hunting are their own.

When the whaling season begins, the Eskimos make temporary camps on the ice fields off shore, so as to be as near as possible to the open water. These temporary camps consist of improvised shelters made from upturned boats or frames of sleds, over which skins or paulins are stretched. Fur robes form the floors of the shelters.

Whale hunting to the Eskimo is the most fascinating sport. It is much in the nature of a regatta, with honors going to the boat which kills the first whale of the season. Despite its romance and glamour for the native, however, the hunt has a serious purpose; a successful season assures a winter's supply of food for the entire village.

With sails hoisted to the wind, the boats to the number of 10 or 12, each carrying three or four hunters armed with rifles, depart out upon the Arctic Ocean. They spread out over a vast area fully 50 miles square. Each boat carries a flag, and when a whale is struck, the signal is hoisted, whereupon all the other boats hasten to the assistance of the fortunate hunters. Usually the whale has been killed by the time the other boats come up.

A few of the Eskimo hunters have whaling guns, which shoot an explosive harpoon that instantly kills. Others have only their rifles or spears, with markers and buoys consisting of seal skins inflated with air.

Weather conditions increase the hazards of hunting upon the ice-strewn Arctic sea. A storm may arise suddenly

and blow the hunters far from home. When these storms occur in the Arctic, they usually last for days. The hunters, carrying only bare necessities, suffer greatly. Blizzards are to them as deadly as fogs in temperate waters are to fishermen there. The Eskimo has an unerring sense of direction, but this avails him little when the wind, lashing the grinding ice floes, cuts off retreat toward home. He must fight it out on the open sea and wait for the storm to subside.

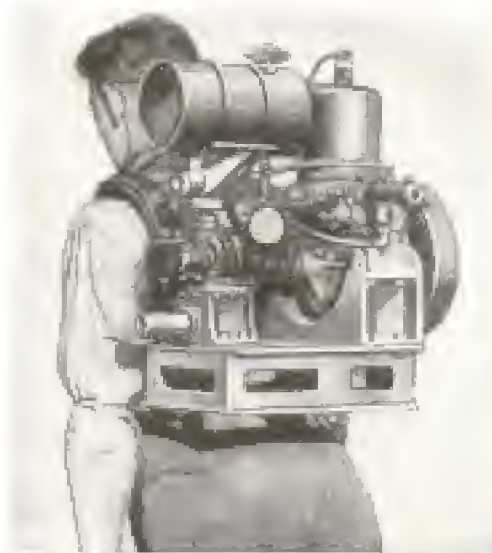
When a whale is captured, the boats of the hunters assemble at the scene as quickly as they can. The boats are lined out, with sails up, each towing the other, the dead whale bringing up the rear, and the slow voyage homeward is begun. When shore is reached, the whale must be cut up in the water, since there are not enough men to drag the great carcass up on shore.

When the whaling season is over, each successful hunter gives a *na-lu-ka-tak* (celebration), with the rest of the villagers as his guests. There is feasting, blanket tossing, and a dance at the end of the program, which often lasts for days. All the old men and women, and the sick Eskimos, are guests of the prince of the whale hunt. Those not able to walk are carried by the men or hauled on sleds to that part of the village selected for the feast.

A feature of the *na-lu-ka-tak* is blanket tossing. Girls and young women are the best blanket jumpers. Thirty to thirty-five feet is a common jump. Some of the men are also good at this popular sport, but because of their suppleness, women always carry away the honors.

7822
**FOREST RANGERS'
FIRE ENGINE CAN
BE CARRIED
ON BACK**

Fire engines, light enough for one man to carry on his back, are being manufactured for the use of forest rangers. The complete outfit, including the tank filled with gasoline, weighs only 74 lb. and will deliver 20 gal. of water a minute through a 1,500-ft. hose. The single-cylinder gasoline engine is said to be the smallest and lightest



New Light-Weight Fire Engine for Forest Rangers, Showing How It is Carried

fire engine built. It will throw a stream ranging from 7 gal. a minute, with 160-lb. pressure, to 21 gal. a minute, with 90-lb. pressure. A two-cylinder outfit is also being made, which weighs 125 lb. Its stream ranges from 20 gal. at 115-lb. pressure to 40 gal. at 85-lb. pressure.

Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

*Northern Fire Apparatus Co.
Minneapolis, Minn.*



A Hunter's Automobile Fitted for a Long Trip: On the Running Board Is a Cage Large Enough to Hold Two Dogs in Separate Kennels. Above the Cage Are a Gun Case, Holding Three Guns, and a Water Tank

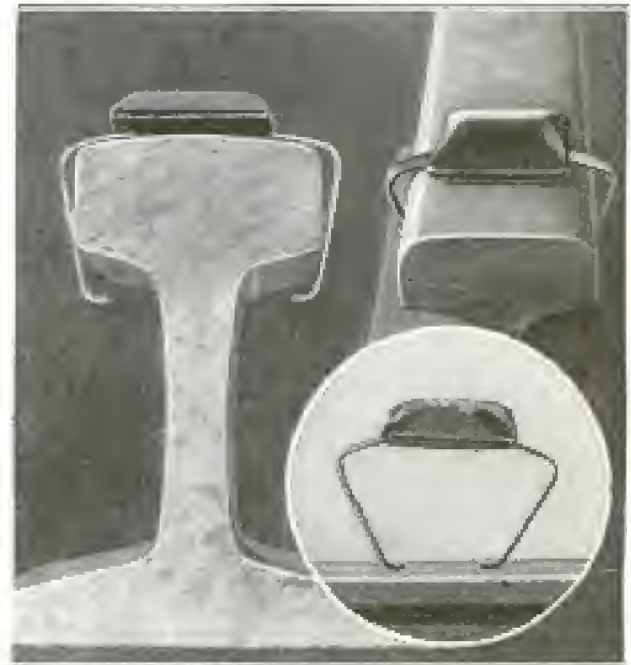
HUNTING DOGS RIDE IN CAGE ON AUTO RUNNING BOARD

To save the strength of hunting dogs for work in the field, they are carried, where the distances are long, in comfortable cages placed on the running boards of the automobiles which carry the sportsmen. The cage is 69 in. long at the bottom, 25 in. high, and 12 in. wide inside. A partition in the center divides the carrier into two kennels. The cage is made of light lumber and lath, and has a canvas curtain on the weather side which can be let down to protect the dogs from wind and rain. Two metal bars, bent to fit the running board, are clamped beneath to hold the cage. A rack or box carrying three guns is placed above the kennel. And, of interest to those shooting in Dakota, for instance, where water supplies are sometimes far apart, there is provided a metal water box, which also rests on the kennel. This box is fitted with a stopcock at the lower part, making it easy to draw off water without opening the box.

TRACK TORPEDO THAT APPEALS TO SIGHT, SMELL, AND HEARING

A new track torpedo, or fog signal, has been adopted by the Canadian Pacific Railway, that instead of appealing only to the sense of hearing, like the conventional signal, appeals to three senses—

hearing, seeing, and smelling. When used by trainmen to protect trains from the rear, the torpedo is attached to the rail head, in the usual way, with a spring clip.



Track Torpedo, or Fog Signal. That, When Detonated, besides Making a Loud Report, Like Other Torpedoes, Gives Out a Brilliant Flash, and Emits a Pungent Odor

When fired, it not only makes a loud report, but also gives out a brilliant flash, and emits a pungent odor. It is made waterproof, and resists any atmospheric conditions of heat, cold, or moisture. This is essential in the Canadian climate with its great variations in temperature.

Canadian Pacific Railway
 342 Madison, New York City

172 Chicago POPULAR MECHANICS
 47875 *Wreck*
**LOCOMOTIVE THROWN UP SIDE
 OF HILL BY COLLISION**

When two trains met in a head-on collision, near Bryn Athyn, Pa., not long ago, one of the locomotives was thrown

of the Ethiopian Empire. The expedition has returned from 10 years of exploration in Egypt. The principal discoveries, relating to this formerly unknown portion of history, were made at Napata, the ancient capital of Ethiopia, now called Gebel

Barkal, at the foot of the Fourth Cataract of the Nile River. At this point a group of pyramids were examined, and it was learned that the royal family of Ethiopia sprang from a tribe of Libyan nomads, who entered and became a part of Egypt, revolted, and later conquered the older country. Pieces of sculpture, paintings, and art objects, which were obtained, represent a remarkable civilization and the highest development



After the Crash: One Locomotive was Thrown Up on the Side of the Hill by the Force of the Impact

high up on the side of a hill bordering the track by the force of the impact. The accident occurred on a single-track line between Philadelphia and Newtown, over which two local trains were running in opposite directions. Through some error they met on a curve. Though both engines were smashed and the trains badly wrecked, the crash was not directly responsible for all the deaths and injuries. Almost immediately after the crash the coaches caught fire, and many of the 25 deaths and 20 injuries were the result of the fire.



Most of the Injuries to Passengers and Damage to Property were Caused by Fire, Which Enveloped the Train Almost Immediately after the Collision

of Egyptian art. The expedition was probably the most thorough, scientifically, that has ever been conducted.

¶ Miniature pieces of furniture and many other everyday objects are used by Miss Mary LaVergne to teach simple French to beginning students, in the Minneapolis, Minn., South High School. Pupils use no textbook during the first term but, after this preparation go through the book as easily in the following two terms as other students do in three.

4934 **HARVARD-BOSTON EXPEDITION
 FINDS ETHIOPIAN RECORDS**

Discoveries made by the Harvard-Boston Archeological Expedition headed by Prof. George A. Reisner, of Harvard University, have made it possible to write the history of the establishment and rise

Christian Science Monitor

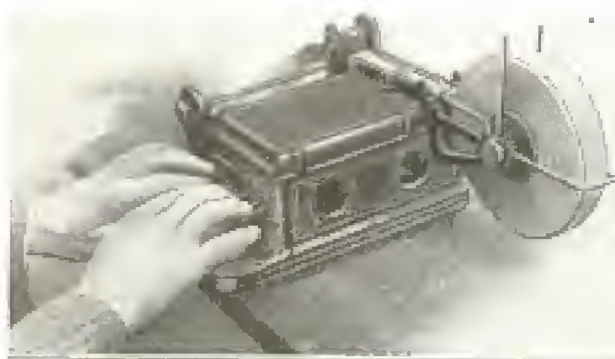
12/2/21

GARAGE ZONING REGULATIONS TESTED BY APPLICATION

On the whole, the zoning regulations for garages, adopted by New York City in July, 1916, have proved highly satisfactory. Some defects have appeared, however, in the practical application of these regulations which should prove of interest to other communities now considering similar legislation. The principal defect is in the provision permitting the building of private garages, for not more than five motor vehicles, as accessories to residence buildings on the same lot, in residence districts. Such an accessory garage cannot be rented in whole, or in part, or used for business vehicles. It is felt that such rental and storage should be permitted as an incidental use, but that it would be abused if allowed. The proper solution is said to be the reduction of the number of cars permitted to three, and the allowing of one space for rental or storage of light business vehicles; which would require an amendment of the law.

MACHINE MAKES RAISED-LETTER COPY FOR BLIND TYPEWRITERS

Teaching many of the soldiers blinded during the late war to use typewriters as a means of earning their living, is a laudable effort of the German government. To prepare copy for the use of those so afflicted, a machine has been designed which stamps raised letters upon a tape. These letters are "read" by the blind typists, who use the highly trained sense of



This Machine is Used to Prepare Copy for Blind Typists by Stamping Raised Letters on a Tape

touch in their fingertips, and afterward write them on a regular typewriter.

International Photo
 Service, 326 W. Madison,
 Chicago

HAND FLASHLIGHT ADAPTED AS MOVIE-FILM PROJECTOR

Single views, clipped from moving-picture films, can be projected on any



Above: The Projector, Placed on a Table, Throws Pictures on an Ordinary Wall. Below: Enlarged View, Showing Construction

white surface by means of an ordinary hand flashlight with a special lens and slide. The flashlight rests in nickelplated clips on a wooden base. A special reflector-and-lamp unit produces about 15 times the light of an ordinary flashlight and enlarges the 1-in. film view to a 9-ft. picture, with perfect detail. In the front end, which is telescoping, is mounted a metal slide carrier with three film apertures.

LARGEST ALL-AMERICAN-MADE TWIN-SCREW MOTORSHIP

The "Californian," the largest twin-screw motorship built and fully equipped exclusively in the United States, was recently launched at Chester, Pa., and it will be followed at an early date by a sister ship, the "Missourian." They are considered the most efficient type of motorship for long-distance voyages. Their dimensions are, 461-ft. over-all length, 59-ft. 8-in. beam, with a draft of 28 ft. at a deadweight tonnage of 11,000. The power equipment consists of two six-cylinder single-acting Diesel engines, each rated at 2,250 indicated horsepower at 115 r.p.m. The contract speed is 13¼ miles, and the normal fuel capacity is 1,400 tons, with a reserve capacity of 760 tons, giving a normal cruising range of 25,000 miles.

Marine Journal
 Dec 5, 1921

Randell Projector, 4 mc. 817 & 34-H. 81. New York.

42 20
174

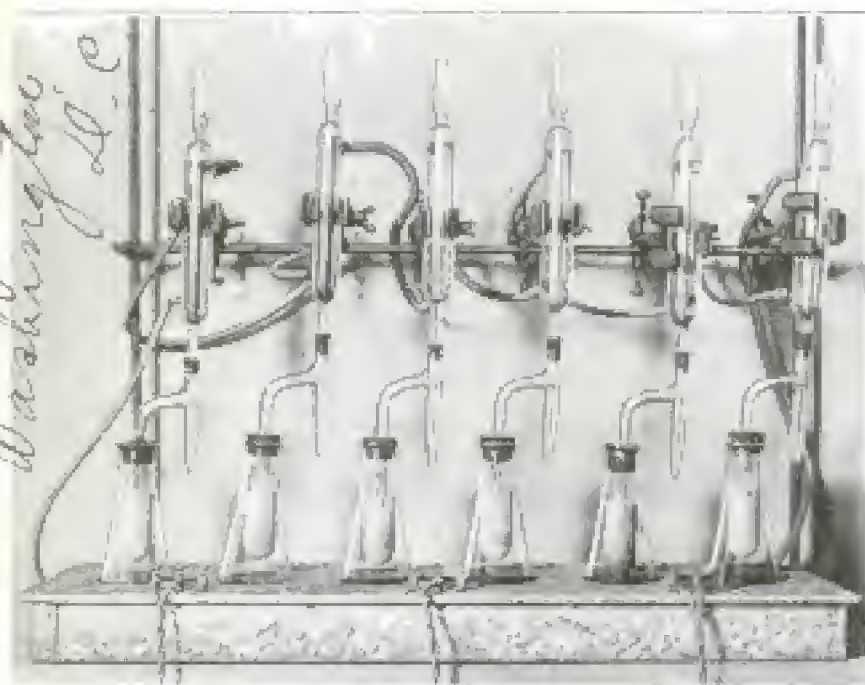
DEVELOP EFFECTIVE PROCESS FOR RECLAIMING WASTE COAL

Laboratory studies by the United States Bureau of Mines indicate the pos-

is then washed into a container and allowed to settle, after which it is transferred to a churn, with a paddle revolving at 1,000 r.p.m., where it is mixed with water. Oil is then added and the churning is continued. This

action results in small egg-shaped granules, known as amalgam, which are the ultimate aim of the process, and are composed of purified coal, oil, and 10 to 30 per cent water. The entire mixture is next poured onto a 100-mesh screen and drenched with a fresh supply of water. It is then placed in the churn and washed until the amalgam is free of all mineral matter.

It is claimed that this process is practically effective. Combustible matter is recovered to an extent exceeding 95 per cent. Mineral matter is eliminated to a satisfactory degree with



Laboratory Apparatus Used by the United States Bureau of Mines in Experiments to Develop a Practical Method of Reclaiming Waste Coal

sibility of reclaiming millions of tons of inferior coal, now going to waste at the mines, by a new method of refinement. The coal is pulverized sufficiently for free passage through a 200-mesh screen, finer pulverization not yielding a great enough reduction of ash to warrant the increased expense of finer grinding. It

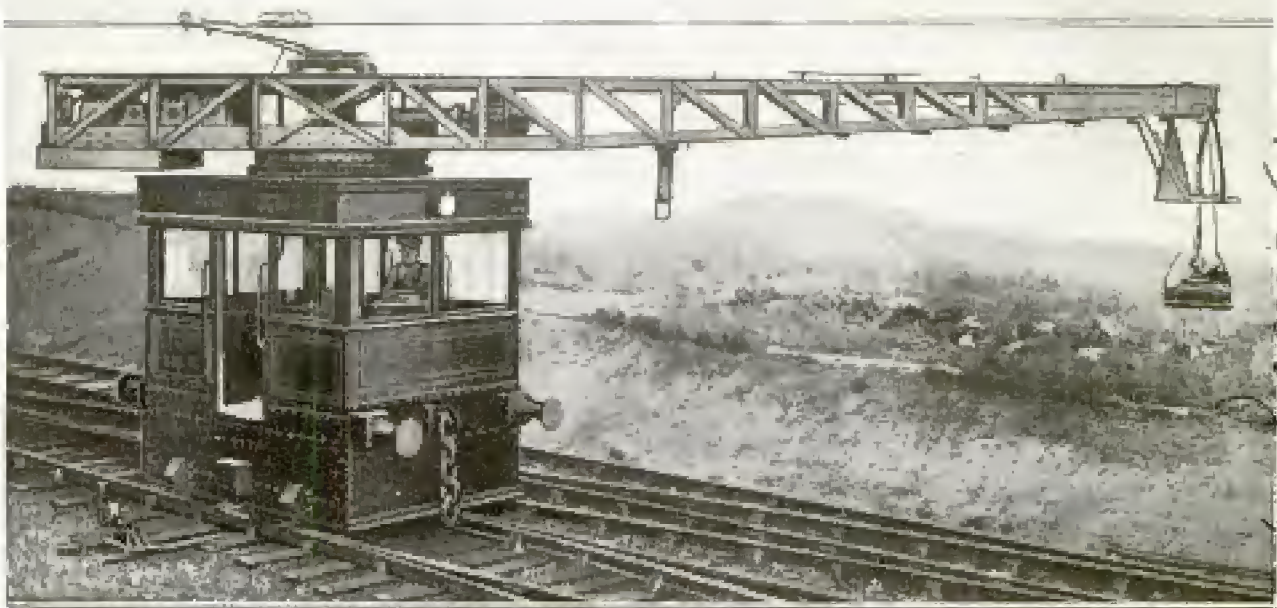


Amalgam Granules, Varying in Size Down to About One-Eighth Inch in Diameter, the Final Product Obtained in Reclaiming Coal



At the Left: The Apparatus Used for Drying the Amalgam After It has been Washed. At the Right: The Churn Used, in the Laboratory Experiments, for Mixing the Powdered Coal with Oil

either bituminous or anthracite coals, and the sulphur reduction is favorable with anthracite, though not with bituminous coals. Any oil having a high viscosity may be used, and oil wastage is negligible. For coal containing 25 per cent waste material, 450 lb. of light fuel oil to the ton of coal are required. Reaction takes place most readily with coal which easily absorbs oil but is not readily wetted by water, and with oil which does not easily form emulsions with water. Bituminous coals and graphite are more responsive to this treatment than lignites.



Combination Electric Locomotive and Magnet Crane Which is Operated by One Man: At the Top is Seen the Trolley, and at the Right the Lifting Magnet is Shown at the Extreme End of the Crane

9851
**MAGNET AND CRANE MOUNTED
ON ELECTRIC LOCOMOTIVE**

The combining of an electric locomotive with a magnet crane has produced beneficial results in England, as it can be handled by one man in the loading or unloading of iron. The crane has a 28-ft. radius, traveling in a complete circle in 30 seconds, while the lifting magnet is strong enough to sustain 10,000 lb. with its 2-in. steel plate. The locomotive possesses a speed of seven miles per hour, and has a framework of steel. The equipment is fitted with the usual standard motors, controllers, and trolley system.

8011 *Railroad Construction*
**ONE HUNDRED TONS OF RAILS
MADE INTO SOUVENIRS**

The fiftieth anniversary of the inauguration of railroad service in Japan was celebrated recently at Tokyo. About 3,000 persons took part in the ceremonies, which were held in a pavilion in front of the central station. More than 100 tons of steel rails were cut into 170,000 thin slices, bound with brass, and presented, as souvenir paper weights, to those attending the celebration. These rails were the first steel rails laid in the country, in 1871, on an 18-mile line between Tokyo and Yokohama. There are now 8,500 miles of railroad in Japan proper. The first locomotive, imperial coaches, and other pieces of early equipment were exhibited.

Railway Age
12/19/21

4667
**GOLF-BAG HOLDER CLAMPS
ON AUTO RUNNING BOARD**

To the golf enthusiast who drives his own car, a new golf-bag holder for the machine should prove a great convenience. It is made of strong flat-steel stock, neatly finished in black enamel. Firmly clamped onto the running board of an automobile, it provides a safe and convenient place to carry golf bags.



This Golf-Bag Holder, Clamped to the Running Board, does Not Detract from the Appearance of the Car

Standley & Shid
Chain Co. & Co., Inc., Iowa

Mass. Chapman & Co. Ltd., Engineers
Philadelphia, Pa.

7491 English - Claimer Co. Ltd
 Coventry, England
 E. H. Lemonon 27, Rue d'Anglais Paris France
 Faged Motors Co, Oakland Calif



An American Motor Bus of the Latest Type Which Seats 20 Persons, Weighs 4,000 Pounds, Has a Speed of 50 Miles an Hour, and Possesses Two Trucks of Four Wheels Each: The Eight Wheels Are a Distinctive Feature of This Car, and Due to Them Are Advantages Such as Double Axles at Either End, Elimination of Skidding, Easier Riding, and Added Traction

MOTOR-BUS

Astonishing Develop
 Prefer Busses to Rail

NOTEWORTHY departures from the usual manner of travel by tourists, have been evidenced by the constantly increasing demand for reservations on motor busses operating in various parts of the world. And equally remarkable have been the developments in the construction of these busses, until at the present time there have been incorporated into them sumptuous appointments which rival the best accommodations available on railroad trains or steamship lines. If present indications may be taken as a prophecy, the bulk of tourist migration in the future will be handled by this method of transportation.

Ancient and medieval ruins, together with historic and romantic localities, will always be the Mecca of tourists, and pilgrimages to these places are being made more pleasurable each year by the facilities offered by the motor bus. While pleasure seekers annually migrate to all sections of this country, in advance of inclement weather, California is undoubtedly the greatest magnet for this class of people, and it is fitting that the latest development of the motor bus should emanate from there. The innovation consists of an eight-wheeled car, with a seating capacity of 20 persons, and a spacious compartment for the baggage of the passengers. For safeguarding the traveling public, the eight-wheel bus possesses many advantages over the four-wheel type. The new machine steers on all front wheels, which are fastened together by a special spring suspension, and constitute a truck, as likewise do the rear

TRAVEL ATTAINS WORLD SCOPE

ments in This Mode of Transportation—Tourists of the Future may roads—Motor-Car Touring will be Brought within the Reach of All

By H. A. LANE

wheels. The car is driven by, and the brakes are applied to, the four rear wheels, so that its superiority is obvious. If, when running at top speed, one front or rear axle should break, the other axle would maintain the weight of the car. Likewise, if under the same conditions a front tire blows out, the machine can be steered on the three remaining tires, thus avoiding an accident. Although the bus weighs 8,000 lb., the pavement strain is considerably less than would be the case with a four-wheel car of the same weight, because of the eight bearing points, and because an air pressure of only 70 lb. is used in the tires, in comparison with the 90 lb. of the four-wheel type. Extensive tests made with this machine have satisfactorily proved that it will not skid, that it rides more smoothly and more comfortably than any four-wheel motor car, and that an average of 10 miles can be made on one gallon of gasoline. The eight-wheel bus has five cross seats for passengers, with a door for each seat, while the driver's seat has a door on each side. Although the interior of this new departure in motor-bus building is comfortably upholstered, there can be no comparison be-

tween it and some of the luxuriously arranged busses in Europe.

European motor-bus travel has reached



Rear End of the Eight-Wheeled Motor Bus, Showing the Compartment for Accommodating the Baggage of the Passengers and the Spare-Tire Compartment Just Below

such enormous proportions as to warrant the construction of veritable "palaces on wheels." The most elaborate of these coaches are to be found on the French line operating between Calais and the Riviera. Nothing has been spared which might add

to the comfort of the six-day trip between these points. The huge inclosed busses, with their highly polished maroon bodies, and fitted with large plate-glass windows, present a most imposing appearance. The seating capacity of this type of car is 20 persons, and provision is made for the travelers' baggage by the construction of lockers beneath the chassis, and by a guard rail on the top. Seats which hold two persons each, are placed, three on a side, at the forward end of the bus, and face forward also, leaving an aisle down the center to the seats in the rear. A U-shaped seating arrangement, extending around the bus in the rear, gives space for eight persons. The seats are beautifully upholstered in a serviceable French gray rep, with the back and seat cushions deep



Front Truck of the Eight-Wheeled Motor Bus, with One Wheel Resting upon a Curb, Graphically Illustrating the Remarkable Flexibility of the Axle Arrangement

A. C. E. M. C. A. 9 Rue Tronchet,
Paris, France

French. Mue. Ocean Tréves, 162, Rue Champagnonnet, Paris, 18. France

7491



One of the Lavishly Equipped French Motor Busses Now Operating between Calais and the Riviera, Which Have a Seating Capacity of 20 People: They are Fitted with Tire-Safety Apparatus and Arrow-Signaling Appliances; One of the Latter can be Seen under the Right Headlight

and well sprung. Nickelplated fittings are used throughout, including the grip handles on the transverse seats at the front end. Electric cigar lighters are installed, ash trays are fastened to the seats, and neat electric-light fixtures are mounted in

the ceiling, which is finished with the same cloth as the seats.

There are four windows which can be raised or lowered at will, on each side of the bus, and one large square observation window, which is immovable, is placed in the rear of the body. A bevel-edged full-length mirror is located just behind the driver's compartment, and at the end of the center aisle. The vehicle is fitted with day and night safety signals and tire-safety valves. The safety signals consist of two arrow indicators, one at the front and one at the rear, and are operated from a control box near the driver. At night, the arrows are illuminated, the front one showing green, and the rear one being red. An electric horn sounds automatically with the operation of the signals, so that other motorists have their attention drawn to the intended change of direc-



Interior of the Calais-Riviera Motor Bus, Showing the Seating Arrangement: On the Table and the Ceiling can be Seen the Electric Fixtures. The Windows Shown Are All of the Finest Plate Glass

tion. The tire-safety valves project from the rim of each wheel, and when the pressure of air in the tire falls below a certain amount, a spring attachment is released, which explodes a cartridge, thus informing the driver of the condition.

Somewhat similar to the French busses are those to be seen in England, which are designed to accommodate 26 passengers. The English vehicle is divided into two distinct compartments, one immediately behind the driver's seat and one at the rear. In the front compartment are two transverse seats extending the width of the body, and having a capacity of 10 persons. The rear compartment has seats running around the sides of the car which comfortably accommodate 16 persons. Each section of the bus has a separate entrance. The interiors are elaborately fitted, and have polished-walnut finish, except the ceilings, which are of white-enamelled linoleum. Electric lighting is provided throughout, as in the

French machines, and the upholstery is of real antique leather.

Plate-glass windows,

which can be raised or lowered, surround the rear compartment except at the back, where a large oval observation window is placed. A locker extends along the entire left side of the bus for the carrying of baggage. Another type of English motor bus has a capacity of 18 passengers, and



Interior of an English Motor Bus Which Has Two Separate Compartments with a Seating Capacity of 26 Persons: The Rear Compartment Only is Shown Here

all the seats are of the revolving-armchair kind, except four that are built into the back of the body. The swivel seats are arranged in three rows facing forward. If the bus should be engaged by a small party, the four seats in the center row can be removed, and a long table brought into use. The table folds neatly against the underside of the top when not in use, and is held there by spring brackets, entirely out of the way of the passengers. It is a simple matter to lower the table into position, and as the seats revolve, it is possible to turn them toward the table,



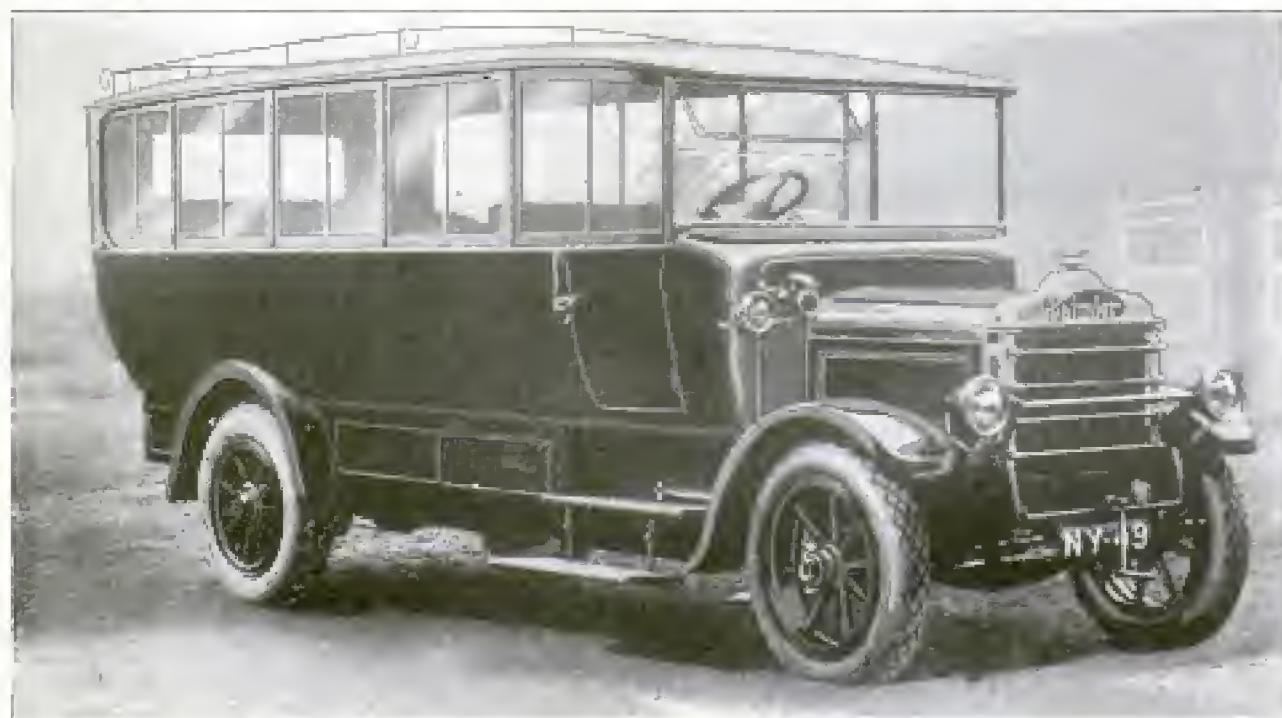
Exterior of the English Motor Bus: The Woman Seated Is in the Front Compartment, Which Has Transverse Seats, and the Other Woman is Standing in the Rear Part

so that the tourists can enjoy one another's company in the participation of refreshments, or in various kinds of games. As in the French motor busses, nothing has been overlooked in the way of conveniences for the passenger, as far as it was in the power of the bus builders to install them. The same holds true of the many busses now operating in Scotland, Norway, Switzerland, the French Alps, the Pyrenees, and other points at which tourists gather in Europe. When a traveler makes a reservation on one of these modern motor busses, he is assured of all the comforts of a private limousine, while enjoying a wonderful sight-seeing trip.

While pleasure seekers undoubtedly dominate motor-bus travel in Europe, this mode of transportation is being applied in practical usage in the United States. Numerous sections of this country have found these cars to be an essential means of overland travel. Especially is this true in Minnesota, where between 70 and 80 bus lines are operated to connect the peculiar fan-shaped system of railroad lines, which run out of St. Paul and Minneapolis to all corners of the state. Thus, a traveler desiring to go from a point on one line to a point on another, can take a cross-country trip by motor bus, instead of riding back to the Twin Cities and then out on another line. Even along the railroad right of way, the busses can successfully compete with the steam roads, because of the possibility of stopping at every farmhouse on the route,

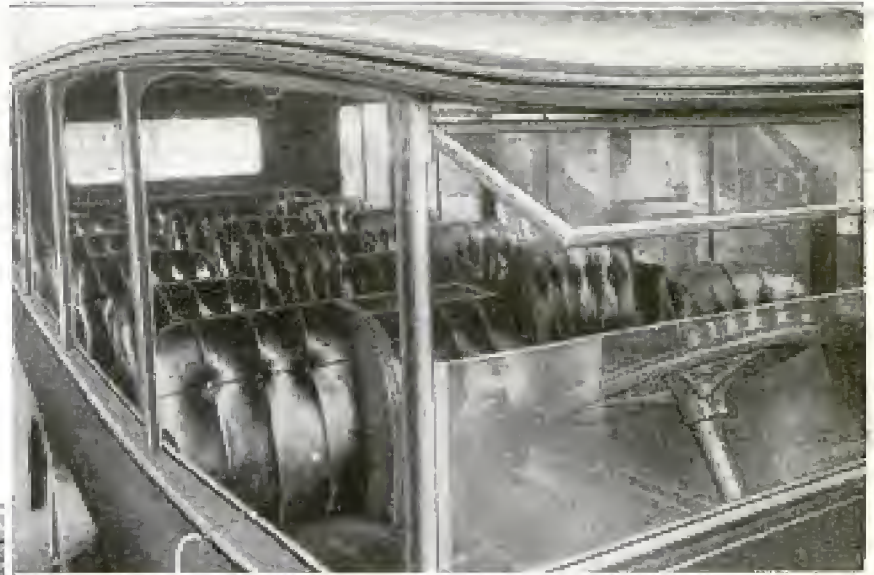
if necessary. Each of these farmhouses is designated as a "station" on the bus-line schedule, consequently the farmer is assured of transportation to his very doorstep. The Minnesota busses have regular passenger terminals, time tables, tickets, and advertising literature similar to that used by the railroads, and this is prominently displayed in hotels and other public places along the route. These motor busses are not as lavishly equipped as the European bus, as they are not considered pleasure conveyances, but this country may see the entry of the elaborately furnished motor bus into the coast-to-coast touring field, if certain rumors of an intended bus line to extend from New York to California, prove to be founded on fact. Regardless of the rumored Atlantic-to-the-Pacific line, the initial trip of Lakes-to-the-Gulf expeditions has recently been completed. This premier of bus-touring parties to southern climes was organized in Chicago and departed from there not long ago.

The owner of a fleet of the familiar sight-seeing cars endeavored to find a profitable use for his property during the winter months. He advertised a proposed trip to New Orleans, with side excursions to the Mammoth Cave, Civil War battlefields, and other places of interest. The idea was eagerly accepted by prospective tourists, and in a few days all available seating space was reserved on his six machines. The cars were then fitted with inclosed tops similar to those used on the

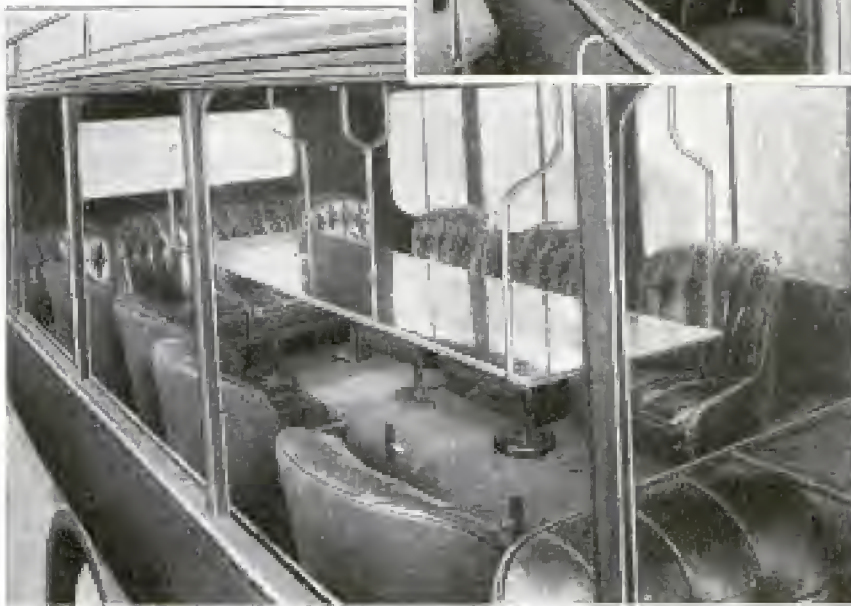


Another Type of English Motor Bus, Having One Compartment Only, with a Seating Capacity of 18 Passengers: On the Running Boards, in Front of and behind the Rear Fender, Are Lockers for Baggage

busses in the national parks, and the first Lakes-to-the-Gulf motor-bus party started on its pioneering trip. The picturesque Dixie Highway was chosen as the route of travel, and a wonderful 1,600-mile sight-seeing trip was enjoyed on the way to New Orleans. While in the South, the busses can be returned to their usual use as sight-seeing cars, and in



Interior of an English Motor Bus, Showing the Seats Arranged in Three Rows: With Small Parties the Middle Row is Removed to Make Room for a Table



Same as Above, Except with Middle Row of Seats Removed and a Table Installed: When Not in Use, the Table Folds and is Fastened against the Ceiling of the Car

the spring, the owner will doubtless find many tourists eager to make the trip back north.

Thus it is apparent that motor-bus touring, the world over, is going to increase in popularity each year, and to the people will be offered ample opportunities of forming an intimate acquaintance with the many wonders and beauties of the earth.



An American Motor Bus of the Trailer Type: The Trailer will Accommodate 25 Passengers and is Attached to the Chassis of a Small Car. Although the Bus Appears Unwieldy, It can be Turned Around in a 50-Foot Space without Backing, and in an Ordinary Street by Backing Only Once

Adams Trailer Corp., Garden City, N. Y.

Amv.
 Charles S. Van Horn,
 702 S. Spring St.
 182
 7890
 Los Angeles, Calif.

Dubuque Boat
 & Boiler Works
 Dubuque
 Iowa.

POPULAR MECHANICS
 NEW TROUT-LANDING NET
 CARRIED IN POCKET

No more need the fisherman lose his temper, and perhaps the fish, because his landing net becomes entangled at the



Left: Trout-Landing Net Sprung Open by Simple Pressure of Handle. Center: Net Closed by Releasing Spring Mechanism. Right: Folded Net Carried in Pocket

psychological moment. A lover of the sport has made a folding net with a spring-steel rim, which can be carried in the pocket until the fish has been hooked and played clear up to the angler. Then the net is grasped, and a simple pressure on the handle causes it to spring open in circular shape, ready for landing purposes. Should the lively trout thrash around too energetically after being landed, the release of the spring mechanism closes the net, making it impossible for the fish to get free.

SMOKESTACK IN TWO SECTIONS
 ERECTED WITH A CRANE

An 80-ft. smokestack was to be erected on top of a building only 25 ft. high, in Dubuque, Ia., and therefore, with the exercise of a little ingenuity, it was found possible to do this with a crane standing beside the building. The stack was 54 in. in diameter, and weighed seven tons. To facilitate its erection in this manner, it was made in two pieces, the lower one 52 ft. long, and the upper one 28 ft., with a hinge provided for connecting them. A 15-ton crane, with a 70-ft. boom, was used, first to lift from its position an old stack which was to be replaced by the new one. The first section of the new stack was then raised by the crane, and when in position, the second section was raised, and held so that a man on top of the boom could make the hinge connection. This left the upper section hanging parallel with the lower one. To the side of the upper section, opposite the hinge, an I-beam was lashed, with one end projecting so as to form a lever, which, when pulled downward with a line connected to a winch at the base of the stack, swung the upper section vertically. The two sections were then bolted securely together. The simplicity of the operation made it possible to finish the whole job in one day.



Erecting a Smokestack with a Crane: Left, the Man on Top of the Crane Boom has Connected the Two Sections at the Hinge between Them; Center, the Top Section is being Swung Upward by Means of a Rope from the Boom, Lashed to the Upper Half of the Stack, to a Winch at the Base, and Right, It has Reached the Vertical Position, and the Two Sections are Locked Together



PHOTO BY WILLIAMS SERVICE

In the Water, at the Left, This Machine Looks No Different from Any Motorboat, but When It Reaches the Shore, as at the Right, One Sees That It is Mounted on Wheels

NEW MOTORBOAT-AUTO LOOKS LIKE A BOAT ON WHEELS

Another combination automobile and motorboat has been built, by a New Jersey inventor. In general appearance, it is like a boat, mounted on springs, on four pneumatic-tired wheels. It was thoroughly tested at Bayonne, N. J., recently, and is said to have performed in a most satisfactory manner. It worked equally well on the land and in the water. By the state authorities, it is classified as a motor vehicle, and it carries a regular state automobile license.

TURBINE LOCOMOTIVE FOR SWISS RAILWAYS

Up to the present there has been comparatively little effort made to apply the steam turbine to locomotives, and less here than in Europe. Among other attempts that have been made in Europe, a notable one is that of a turbine-driven locomotive now being tried on the Swiss federal railways.

The turbine, by means of a reduction and reversing system of gears, drives a shaft

mounted transversely above the forward truck, and having a crank at either end which drives the connecting rods of the six-coupled locomotive wheels. Trials of this locomotive have shown fuel economy greatly superior to that of compound locomotives, and it is claimed that the turbine will ultimately give the same su-

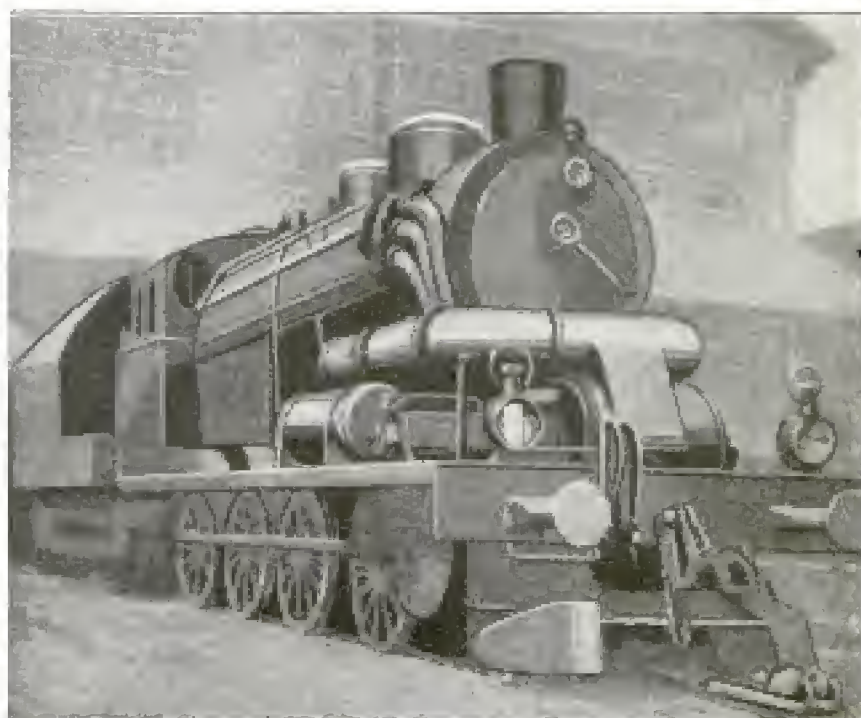


PHOTO BY COURTESY OF MECHANICAL ENGINEERING

Standard Locomotive Changed from Reciprocating to Rotary Drive by Means of the Turbine Seen in Front of the Smokebox: This, through Reduction Gears, Drives a Transverse Shaft above the Forward Truck, Which Has Link Connections to the Coupled Wheels

perior efficiency on the locomotive as it does on stationary and marine engines.

W. G. Lally, Archer, W. G. Lally & Co. Quirich, Switzerland
 Locomotive built at W. G. Lally & Co. Quirich, Switzerland
 W. G. Lally & Co. Quirich, Switzerland

W. G. Lally & Co. Quirich, Switzerland

Mechanical Engineering, March 1921
 La Nature 10/1/21 Chicago Daily News 9/21/21

NEW ARTIFICIAL LEG PERMITS NATURAL KNEE MOTION

An inventor of artificial limbs has long sought an appliance which would force a flexion, or bending of the knee, at every



Left: Weight of Body on Artificial Limb. Right: Weight on Other Limb Allows Elastic Band to Flex the Leg for the Next Step

step, thus producing a natural motion for the manufactured leg. In solving this problem, the maker of the new leg strove to imitate, as near as possible, the muscles of the human limb. By means of elastic bands and a suspender-cord arrangement, he has succeeded to an amazing degree. When the weight of the body is shifted from the artificial member, as in walking, the suspender cords raise the leg and cause it to bend at the knee. The next action of these cords, together with an elastic band, straightens the leg again, so that it is ready to support the body on the next step.

MOUNTAIN IN PACIFIC OCEAN IS HUGE MASS OF SULPHUR

The recent rediscovery of the great sulphur mountain of Vanua Lava, an island situated some 900 miles due east from Australia, which consists almost entirely of sulphur, brings into prominence the possibilities of exploiting the natural fertilizer beds of the islands of Nauru and Ocean, in the southern Pacific Ocean. These islands are famous for their extensive and rich deposits of phosphate of lime, and this, together with sulphur, forms the necessary combination for producing a soluble, or powdered, superphosphate, which is sold to farmers for a fer-

tilizer. Thus it appears that, as sulphur is the special agent needed to change phosphate rock to a soluble state, and since the islands containing the essential ingredients are comparatively close neighbors, as distances in the Pacific go, the economical production of fertilizer will be an assured possibility.

AMATEUR RADIO MESSAGES CROSS ATLANTIC OCEAN

In a recent ten-day experiment, by the American Radio Relay League, 26 amateur wireless stations in the United States succeeded in sending test messages across the Atlantic Ocean. These messages were officially received by Paul Godley, the representative of the league in Glasgow, Scotland. A message was received at the league headquarters, from P. R. Coursey, editor of an English radio magazine, stating that some of the test messages had been picked up by a number of British amateur receiving stations.

GASOLINE REMOVES ASPHALT FROM CONCRETE BY BURNING

Many a workman might have been saved much labor removing asphalt from joints between concrete slabs, or from concrete surfaces, with tools, if he had known it could be burned off by pouring gasoline on it and setting fire to it. Though this method requires caution, it is much quicker and cheaper than the old method, and does not damage the concrete if properly applied. A continuous fire, which might overheat and damage the concrete, should be avoided. It is better to make short, repeated applications of the gasoline. Great care must be taken, in inclosed reservoirs, to provide plenty of ventilation and to avoid setting fire to wooden roofs.



Photo from Waterproof Paint Co., Lancaster, Calif.

ISLAND WIRELESS STATION NORWAY'S WEATHER OUTPOST

On the little arctic island known as Jan Mayen Land, about 71° north latitude, there is a wireless station which serves as a weather outpost for the coast of Norway, 500 to 600 miles to the east and southeast. The island is only 34 miles long and 9 miles wide, its mean temperature is about 4° below freezing, and its weather is exceedingly stormy. Only once, until recently, and then only for a year, has anyone ever remained on it. Because it lies in the direct path of violent storms, which often strike the coast of Norway suddenly and with great

TABLE AND BED ARE COMBINED IN "EFFICIENCY" FURNITURE

Every inch counts in the modern "efficiency apartments," and an aid in the saving of valuable space has appeared in the production of



Right: Combined Table and Bed Shown as Ordinary Library Table. Left: Elevating the Table Top Preparatory to Making Up the Bed

Below: Combined Table and Bed with Mattress Unfolded and Bed Made Up. The Articles on Top of the Table are Seen Undisturbed

damage to shipping, the idea occurred to Norwegian meteorologists to establish a radio station there. An appropriation of \$10,000 was secured and the difficult task of establishing the station accomplished last summer. Since then regular reports, and warnings of storms, have been sent from the Jan Mayen. Once a violent storm blew down the masts and the reports were interrupted, but in a few weeks they had been replaced and the reports were resumed.

a new combined table and bed. In appearance, the table resembles the ordinary four-legged library type, but inside of the legs are a second set of legs which can be raised by means of a crank, thus elevating the top of the table. A peculiar advantage of this innovation lies in the fact that the table need not be cleared off before the top is elevated, as the mechanism simply causes the whole to rise. With the top raised out of the way, the exposed mattress is then unfolded.

TOWER WILL COMMEMORATE FAMOUS IRISH DIVISION

Dedicated to the memory of the men of Ulster, who, as members of the famous 36th division, recruited in that province



Tower Dedicated to the 36th (Ulster) Division, on Thiepval Ridge, Where Some 5,000 of the Ulstermen were Killed or Wounded in One Day

of Ireland, fell in the first Somme offensive, a stately tower, one of the most imposing monuments on the western front, was unveiled November 19, last year, by Field Marshal Sir Henry Wilson, Ulster's most illustrious soldier. The memorial tower is erected on Thiepval Ridge, where, as the division rushed to the capture of the successive objectives, some 5,000 of its men were left dead, dying, or wounded on the field that memorable day of the first battle of the Somme. It was announced that this site on the Thiepval slope will be preserved forever intact, with the German trenches, the barbed wire, and all the wreckage of battle.

VAULT FLOORS ARE LOWERED AND RAISED BY MOTORS

In several great steel vaults, where safety-deposit boxes are kept, the use of electricity is employed in the preparations for opening the vault door. The vaults are so built with respect to the

floors, that it is impossible to open the huge circular time-clock doors without the shifting of a floor section directly in front. A section in the shape of a half circle, and large enough to accommodate the arc of the swinging door, is lowered by means of electric motors. After the massive door is swung open, the motors are again operated to bring the floor back into place, and the same operation is repeated when the door is closed.

GROWING FERNS IN FLORIDA FOR NORTHERN MARKETS

Just outside of Leesburg, Fla., are two large ferneries where many of the ferns sold in northern cities are grown. Since frosts are unknown here, ferns can be raised outdoors throughout the year. It is necessary, however, to protect them against the sun, and for this purpose overhead latticework is built, often covering three or four acres. Its cost is one of the chief expenses. When ferns are to be shipped they are packed in Spanish moss and sent by express to insure fresh delivery. The business is a profitable one, and brings thousands of dollars into the town every year.



A Florida Fernery, in Which the Plants are Protected against the Sun by These Shelters, Built of Latticework and Covering Several Acres

COMMENT AND REVIEW

[These pages were printed December 27, 1921]

SOME 150 years ago a few shiploads of daring pioneers left the Island of Minorca and settled on the east coast of Florida in and around what is now New Smyrna. They cleared the jungle, dug many miles of huge drainage ditches, and planted the land to sugar cane. Several of their sugar mills for crushing the cane, made in Spain of an iron of wonderful endurance, still remain in a fair state of preservation and are today objects of wonder to winter tourists. The Minorcan colony, struggling against the forces of nature and hostile neighbors, worked with tools of very primitive character. In fact they had absolutely nothing corresponding to what we know as labor-saving devices. Soon hundreds of acres of most luxuriant growth

The Old Way

of sugar cane swayed to the fanning of the trade winds. Just as a rich reward was almost in their hands, a series of terrible misfortunes came to pass through cruel enemies, and very few escaped to tell the tale. Nature, as though jealous at the intrusion, quickly restored the state of dense jungle, until there remained little trace of the once prosperous colony except the sugar mills and the great drainage ditches, which latter are today in a remarkable state of preservation and still doing useful service. During the past decade attempts, in a small way only, have been made to raise sugar cane in another part of the state.



TODAY, in startling contrast to the comparatively childish efforts of the Minorcans, vast sugar plantations, planned eventually to occupy hundreds of thousands of acres, are being laid out in the fertile stretches of the Florida Everglades, whose soil, harvesting for untold centuries a rich tropical growth, possesses a fertility which rivals the valleys of the Euphrates and Nile when at their best. Instead of ax and shovel, mammoth tractors, drawing every kind of modern labor-saving machinery, move in solid phalanxes, 150 of them, and at each setting of the sun 60 acres more have been cleared, plowed, harrowed, and made ready for the army of planters who follow. In one year or a little more, the hard roads and tramways will bring

The Modern Way

in long trains of wagons and cars loaded with sugar cane to the crushing mills, from which the sweet juice will flow night and day through a system of pipe lines to the refinery, work on which has already begun. Inasmuch as the sugar cane of the Everglades is said to rank, both in percentage of yield and quality, with the best Cuban cane, the industry may before many years produce a very large share of our sugar requirements, and at a minimum cost, as freedom from frost makes replanting necessary only once in five or six years.

What a contrast between the heroic yet puny efforts of the Minorcans and the irresistible, highly organized, powerful mechanical forces of today, which know neither the pangs of hunger nor the fatigue of tired muscles; and what better illustrates the mechanical progress of recent years, and what the inventor has accomplished to lighten heavy human loads?

While speaking of Florida it is interesting to note that indications of oil in at least one portion of the state are sufficient to warrant drilling, which has already commenced. Whether or not oil is found, Florida will one day be among the most prosperous of our states, with its ability to produce a great variety of grains, fruits, and winter vegetables; its rapidly increasing live-stock interests of pork and beef; its oysters and fish; its abundance of artesian water, and a climate, skies, and sea waters which fairly rival the Mediterranean.



IT cannot be other than a tremendous satisfaction to Marconi to have lived to witness the universal use of his discovery of how to hurl a message through air across oceans to ships and over continents to cities, thousands of miles apart. What hardly 20 years ago was almost a miracle, to be performed only by experts and scientists, has now become so easily done and understood, that some 60,000 amateurs, chiefly boys in their "teens," with antennæ raised from barn or ridgepole, daily and nightly pick up messages from points thousands of miles distant, or listen to lectures, concerts, and grand opera delivered far from their homes. While it yet seems a long way off, is it unlikely

Progress in Wireless

that before another 20 years shall have passed we may be provided with instruments which anyone can conveniently carry in his pocket, and so converse with home or office while walking from one to the other?

The electrical department of the city of Chicago has announced completion of plans for the installation of wireless telephones which will enable headquarters to communicate with police rifle squads, police and fire boxes, and police and fire-engine stations within a radius of 30 miles.

In telephoning over metallic circuits the important departure just now is the beginning of the end of the career of that efficient and much abused personage—the telephone girl. The start is already made, and as soon as the enormous task can be accomplished, telephone exchanges, even the largest, will require but a few attendants, and these mechanics.



THERE can be little argument over the fact that it takes longer to build up than to tear down, and that in the case of human agencies it is a very much more difficult job. Even in the most remote hamlet few have failed to realize to what

Improved Mail Service

depths of inefficiency our once so greatly admired national postal system had sunk: letters which once had seldom failed to pass from one part of a city to another part in three hours, at last took three working days, or more, to get through. When the previous postmaster-general finally relegated practically all second-class matter to the realm of coal and corn, and sent it like them by freight train, it seemed as if the last prop had been removed, and the morale of the whole army of postal employes went down at

the same time. It has been no easy task to rebuild the once fine spirit of the men, especially after large numbers of the best had been forced to take up other occupations, and it is therefore a great source of satisfaction that already we can all see good results and a vastly improved service.

Among the many needed reforms, perhaps none is more directly felt and appreciated by the millions than the restoration of newspapers and magazines to carriage in mail cars on mail trains instead of box cars on freight trains. No longer the wait of two and three days until enough accumulated to make a carload. Now it goes out promptly, and keeps going, instead of being sidetracked and forgotten, sometimes for weeks. Where a year ago one copy in each 150 of this magazine sent to mail subscribers was reported to us as not received, last month only one in each 1,500 failed to reach destination, which includes copies carelessly wrapped or whose wrappers were unavoidably torn in transit. And what is really exasperating is, after having suffered several years with a most abominable service, that the present postmaster-general is actually able to rush the papers and magazines without increasing his force and still save \$268,000 a year of what the freight system cost. The letter service has shown a corresponding improvement, possibly even more so, and grateful readers and publishers alike say, "Thank you, Will Hays, P. M. G."



THAT there is a steady, even though somewhat slow, reaction toward the sales-tax idea cannot be denied. Secretary of the Treasury Mellon has now expressed himself as favoring a general sales tax with a continuation of the personal income

The Sales Tax

tax for the "rich." As no one, rich or poor, who has given the subject even moderate consideration, has asked or expected anything different, it ought to be worth the while of anyone whose income is over \$6,000 a year to inform himself about the sales tax. If his income is less than \$6,000 per year, it affects him only to the extent that where he is now "soaked" 23 per cent through indirect tax on what he buys, under a sales tax he would pay about 2½ per cent in the same indirect tax.

In some mysterious way the farmer and laboring man have been made to believe a sales tax would all come out of them, which, like Mark Twain's reported death as related by that beloved author, is "important if true."

A farmer puts the case like this: "A farmer sells a bushel of wheat and gets paid for a peck. The consumer pays for a bushel of wheat and gets a peck." Quite so, and the worst of it is, this condition is bound to continue with very little

abatement as long as the present system of taxation continues. Can anyone be surprised at sluggish sales and reluctant buyers when every retail purchase, from potatoes to penknives, imposes an average tax of 23 cents on the dollar? "When one week of unemployment costs the worker as much as he would pay for a 1-per-cent sales tax for a whole year, it is not difficult to say which he would prefer." And our present system of taxation is largely responsible for the blocking of the wheels of industry.

Cost of Strikes

DO strikes really pay the strikers? How much would be your guess on what strikes cost in 1920? Our government, after carefully compiling the figures of wages lost in this country that year to men on strike, finds it to be \$13,000,000 for every working day, after allowing six national holidays and 52 Sundays. The total for the year is the stupendous sum of \$4,000,000,000, almost enough to run the government itself even in these times of expensive government.

Four billion dollars lost in idleness, which might have been earned, spent on families and homes, and put in circulation!

The striker seems to take an inexplicable sense of independence in going on strike, but if those who have been indulging in the occupation of striking, or are thinking of doing so, would take a pencil and sit down to figure out the net result with their wives, they would then be in a better position to answer to themselves the somewhat essential question—"Does it pay?"

Strange how seldom a strike occurs where there is one employer and one employee!

H. H. WINDSOR

NINETEEN SIGNATURES TO "FOUR-POWER TREATY"

Eighteen delegates signed the "Four-Power Treaty" which was adopted by the Conference for the Limitation of Armaments, but there are, in fact, 19 signatures to the act. The four delegates representing the United States, headed by Secretary Hughes, signed first. They were followed by the seven British delegates, headed by Arthur James Balfour, who signed twice, once for the United Kingdom of Great Britain and Ireland, and once for the Union of South Africa, the only division of the British Empire not having a special delegate; the three French delegates, led by René Viviani, and the four Japanese delegates, led by Baron Kato. Seals were first affixed to the document and each delegate touched his seal, when he signed, to indicate that it was official. The single original copy, written on parchment and bearing the official seals and signatures of the several delegates, will be preserved in the archives of the State Department of the United States, but a certified copy will go, for

ratification to each of the contracting governments. The entire subject matter of the treaty is printed in English and French.



COPIENTS, UNDERWOOD & UNDERWOOD *Chicago*
Facsimile of a Page of the Treaty, Showing Signatures of the
Delegates: Two Japanese Signed on the Next Page

According to earlier usage the document would have been printed in French and in each of the languages of the signatory powers.

190
7904

POPULAR MECHANICS

Illustrated London News Nov. 19/1921
**PREHISTORIC HUMAN SKULL OF
NEW TYPE DISCOVERED**

Another link in the development of the human race was recently discovered in the south-central portion of Africa. The open quarry excavation of the Broken Hill Mine, in northern Rhodesia, contains what is known as "Bone Cave." In this cave many tons of bones have been discovered. These included bones of many different kinds of animals, but none

represents a more advanced stage of development. The scientists of the British Museum hope, with more thorough study, to determine its exact place in the development of the race.

7975
**NEW STRATEGIES EMPLOYED
IN WAR ON BACTERIA**

In years past, great stress has been placed on the bacteria which are responsible for disease, and attempts to reduce human ills were largely made by trying to destroy the organism which produced them. Recently the tendency has been to combat disease germs not so much by efforts to eliminate them entirely by direct means, which is a matter of extraordinary difficulty, but by making conditions unfavorable for their growth, as illustrated in part by the vaccines and antitoxins which are coming more and more into use.

It has been found that stone masons, under certain conditions, appear somewhat susceptible to consumption on account of silica dust inhaled reaching the lungs. Recently it has been determined that this dust does not operate directly as an irritant on the tissues, as was first assumed, but appears to act as a sort of fertilizer for the bacteria, making it easy for them to flourish, once they gain access.

• Attention now is being directed toward finding repellent materials of satisfactory character. It is well known that im-

munity from diseases, or capacity to resist or render them mild in form, apparently comes from the ability of the body, in course of time and acting through several generations, to elaborate or produce these counteracting or, one might say, defertilizing substances. In the future, further understanding of the problem may permit the laboratory to aid man more directly by producing these substances as they are needed to reduce old diseases or to combat new ones.



The Broken Hill Mine in Northern Rhodesia: The Small Circle Marks the Spot Where the Prehistoric Skull was Found, When the Open Quarry Work Uncovered the End of "Bone Cave." In the Large Circle the Skull is Shown in the Position in Which It was Discovered

of extinct species or of human beings. Recently, at the extreme end of the cave, one human skull was found. Some portions of the skeleton were also recovered, but most of the bones were broken to pieces by the native laborers, who were ignorant of their scientific importance. The skull, which has been presented to the British Museum by the mine owners, is different from any prehistoric skull previously found. Though it resembles a southern European type, it undoubtedly

CLEVER ENGINEERING SEEN IN OPENING NEW BRIDGE



DUPTRECHT, INTERNATIONAL

Above: The New Double-Deck Bascule Bridge in Use after being Lowered into the Opening Cut in the Old Center-Pier Bridge. Traffic was Closed for Only 48 Hours, While the Cut was being Made. Left: The South Section of the New Bridge being Lowered into Place. At Each Side the Edges of the Old Bridge, Which Also Was a Double-Deck Structure, can be Seen, Showing How It was Cut Away to Make Room for the New Structure, After It had First been Swung Open.

PHOTO, UNDERWOOD & LLOYD

The opening of the new Wells Street bridge, by which one of the elevated railroads of Chicago crosses the main branch of the Chicago River, marks the completion of what is considered a particularly clever piece of engineering. This new double-deck bascule bridge replaces an old structure of the center-pier type. The two sections of the new bridge were built standing upright, over and around the ends of the old structure, without interrupting traffic until they were fully completed. The old bridge, which was also double-decked, was swung open, and a section cut from its center with oxyacetylene torches. The new bridge was then

lowered into the opening, and traffic was resumed after a delay of only 48 hours. The wrecking and hauling away, in barges, of the old bridge then proceeded without interfering with traffic. The new structure, of the most modern type, weighs 5,000 tons and was built at a cost of approximately 1,000,000 dollars.

❑ Snow, in engine terminals of Canadian railroads, is being satisfactorily disposed of by the use of steam coils in the turntable pits. This not only keeps the turntables clear, but makes the pits available as snow melters. Snow is thrown into the pits, melted, and carried off by the drains.

192
 7815

WELDING-TORCH EQUIPMENT CONVENIENTLY PORTABLE

Specially adapted for use in garages and small machine shops, a new welding torch and carrying-case outfit has been placed on the market. It is a complete



Complete Oxyacetylene-Welding Equipment Packed in Convenient Portable Fiber Case with Handle and Metal Hinges and Fasteners

oxyacetylene-welding equipment that can be packed in a fiber case, with a handle that makes it conveniently portable. The equipment consists of one torch, three extension tubes, five welding tips, one decarbonizing tube, one oxygen and one acetylene regulator, with 12 ft. of hose for each, one spark lighter, one pair of colored glasses, one torch, and one regulator wrench.

4993

SORGHUM SIRUP MANUFACTURED BY IMPROVED METHOD

Raising of pedigreed cane, improvement of chemical operations, and a general cheapening of the processes of manufacture, are three features that have been introduced into the production of sorghum sirup. A cleaning machine has been developed, that does away entirely with handwork in the harvesting and cleaning of cane, and is said to have cut the labor cost nearly in half. The waste from the cane is now constantly fed into the fire boxes in these plants, and constitutes 85 per cent of the fuel used.

New York Times 12/15/21
 C.A. 11-22
 P. 6

6590

CABLE-FERRY SYSTEM FLOATS ICE ACROSS RIVER

During open winters, men harvesting ice on the rivers and lakes of the northern states are driven to many expedients to obtain the ice. In many places only the quiet waters of rivers freeze, leaving the

cable is stretched from the shore across the open channel to the ice field, about half a mile away and slightly upstream. Ice is cut in cakes about 40 ft. square. A piece of plank, having a length of rope tied to it, is dropped through a hole in the cake, and the other end of the rope is attached to a pulley mounted horizontally on a wooden block, which is thus anchored to the ice floe. The ferry cable runs over this



An Ice Cake being Carried along the Ferry Cable, Using the Current to Transport the Ice across the Open Channel

main channel open, and it is difficult to get the ice across the channel to the shore. At an Iowa town, where ice is cut extensively for the railroads and inland communities, a cable-ferry system is used. The



The Block and Pulley, over Which the Cable Runs, are Anchored to the Ice by a Rope and Plank, Dropped through a Hole in the Cake

Am. J. W. Alway
 University of Minnesota
 St. Paul, Minn.

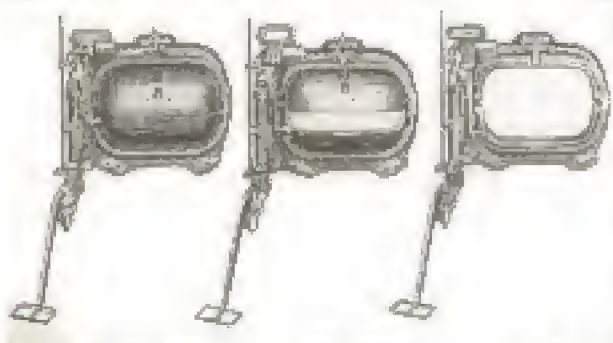
Orin Florence J. Clark
 McCallister, Iowa

pulley, and the pressure of the current against the ice cake forces it along the cable to the shore, where it is pulled in by hand.

7558

AUTOMATIC FIRE DOOR FOR LOCOMOTIVES

Locomotive fire doors, whether automatic or not, interfere, when they are opened, to some extent with some of the appliances behind the boiler head. An improved fire door that occupies exactly the same space whether opened or closed, consists of two semirotating door plates, an operating cylinder with pedal for power operation, and a grip for manual operation. In operating it by power, pressure on the pedal admits air to the cylinder, moving its piston upward, which by a link connection rotates the upper door on its pivots and opens it. By means of a bell crank and link, the movement of the upper door is communicated to the lower one reversely, rotating it to



Locomotive Fire Door That Opens by Pressure on Pedal, Which Admits Air to the Operating Cylinder, Moving the Piston Upward; Link Connections Open Upper and Lower Door Plates

the open position also. When the pressure is removed from the pedal, the doors close automatically, and are cushioned by the air so that they do not slam.

SIT THREE WEEKS IN COLD TO REGISTER FOR LAND

Three weeks of patiently sitting in the bitter cold of Calgary, Can., was the trying experience of two land seekers who were determined to be the first to register for the valuable oil lands recently thrown open by the government. The usual custom of the land office is "first come—first served," hence the desire to head the long line, which always forms on an occasion of this kind, in order to get the choice of the land. The two men who sat exposed to the elements for nearly a month, were adequately provided with blankets, robes,

and even specially prepared booths. The booths were light boxes with a covering of heavy canvas, much resembling a portable steam-bath outfit. Inside of the



These Men, Bundled in Robes, Blankets, and with a Lighted Lantern beneath Their Chairs, are Waiting for the Opening of the Land-Office Registry

booth was a chair, with a lighted lantern underneath, the heat from which kept the men from freezing while they slept in their seats.

LOCKING DEVICE FOR RADIATOR CAP AND THERMOMETER

By using a new locking device, the danger of losing the auto radiator cap and thermometer, or of forgetting the key which locks them, may be avoided. A collar is riveted about the inlet of the radiator. A slotted arm curves up from the collar, and a pin, terminating in a knob, passes through the slot. The other end of the pin is formed into a ring, within which the radiator cap revolves. The cap



Left: Radiator Cap Unscrewed and Tilted Up, but Still Attached to Machine. Right: Cap in Place

is simply unscrewed, and the whole assembly tilted up when the radiator is to be filled.

See Aug. 1921 244

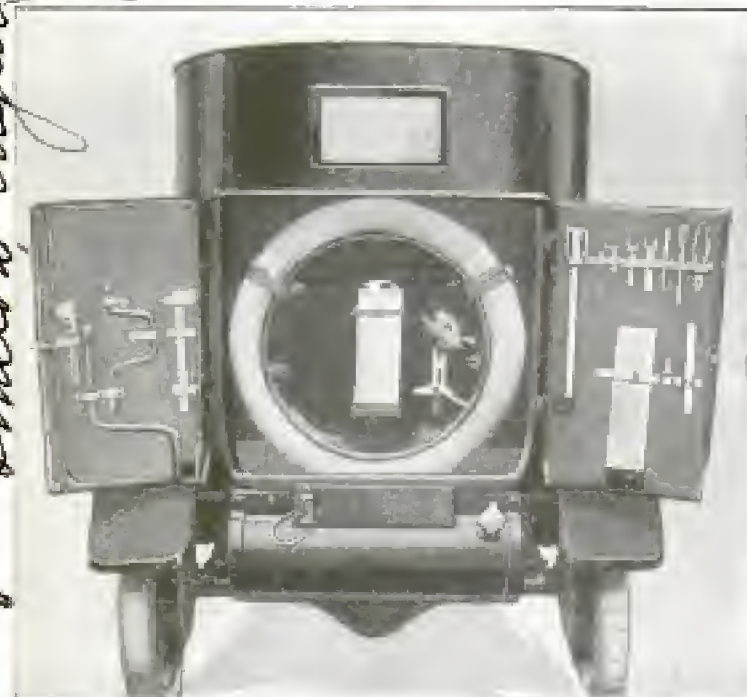
A new paper-backed photographic film has been introduced in Germany. It is cheaper than celluloid film, but as good, and is particularly suited for X-ray work.

Carl E. J. Henderson,
Harbutt Business College, Calgary, Alberta, Canada

E. W. Allen, 14 Ave. 1st St. S. E. Calgary, Alberta

NEW FRENCH CAR HAS LOCKER
IN THE REAR OF BODY

One of the latest-model French automobiles is provided with doors in the



Rear Locker, for Tools and Extra Parts, in New French Machine:
The Doors Close, Forming a Neatly Finished Back

back of the body which, when swung open, give access to a locker. Inside the locker is space for carrying a spare rim and tire, cans of oil, an emergency supply of gasoline, tools, and extra parts. When closed, it presents a neat appearance with all the equipment out of sight, but readily accessible if needed for emergency repairs when on the road.

BRONZE FOR WEATHERPROOF-
ING IN BRIDGE CONSTRUCTION

Bronze as a substitute for paint for preserving structural steel, particularly where it is exposed to the weather as in a bridge, has the advantage of being a permanent weather-proofing material, and, therefore, of avoiding the cost of repeated renewals. For this reason bronze will be used as a protective covering for nearly all the steel in the Hudson River suspension bridge, the \$100,000,000 proposed structure that is to connect Manhattan Island with the New Jersey shore. It will be the first time that this method of weather-proofing has been applied in a structure of anything like the immensity of this suspension bridge, with a central span of 3,240 ft. and approaches of 1,650 ft. each. It is estimated that it will result in an annual saving of \$400,000 in the upkeep of the structure. Each of the four trussed cable systems from which the bridge is to be suspended will be completely inclosed in a

continuous bronze gallery, provided with enough doors to permit occasional inspection. Similar methods will be adopted in other parts of the bridge where the steel is exposed to the weather.

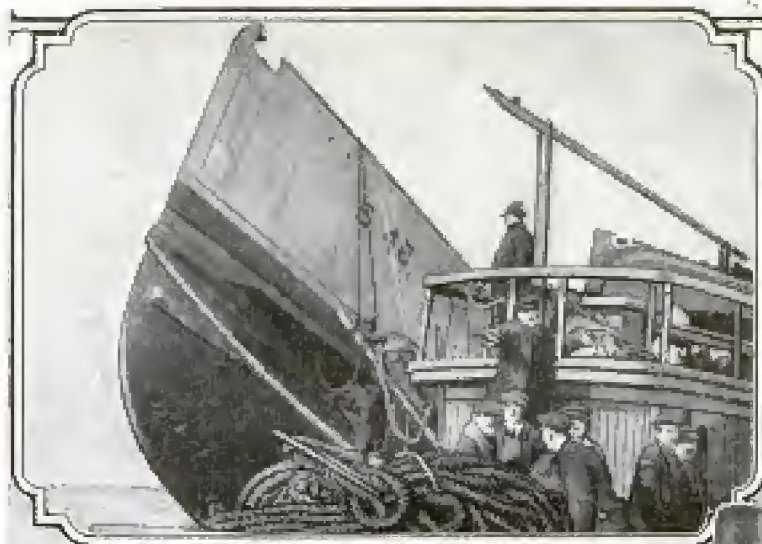
Improved accuracy of American-made weights is shown by recent tests, only seven per cent failing to meet requirements.

PEACE-TIME PERILS OF SUBMARINE SERVICE

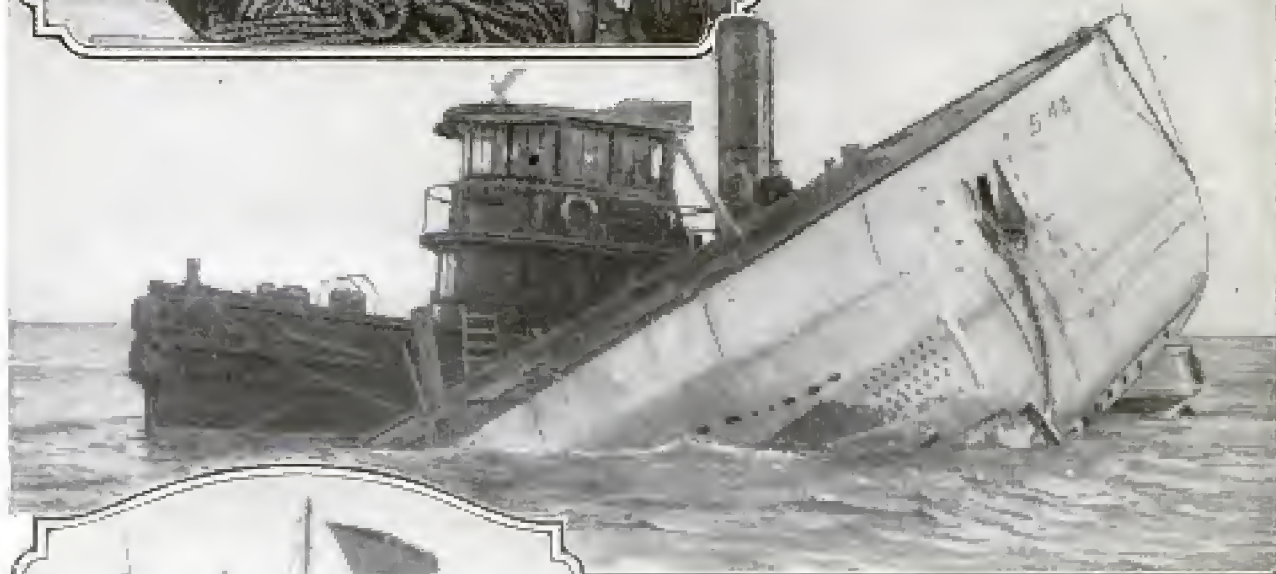
To the submarine sailor, as to the airman, there are perils of peace when there is no war. From their nature, the least mishap in either endangers the lives of the human occupants. In the case of the submarine this has been strikingly exemplified by two recent accidents. On September 26, the "R-6" suddenly filled with water and sank in less than two minutes, while moored alongside the tender "Camden," off Los Angeles. Fortunately, most of the crew were at supper aboard the tender, and only two lives were lost. There then arose the problem of raising the submarine. As the depth was only 35 ft., it was easy for divers to work on the sunken hull, and this was done from a 40-ft. tug that was anchored at the spot. After the hull had been made air and water-tight,

pumps on the tug succeeded in replacing the water in the hull with air. Fifteen days after the sinking this was accomplished, and the giant submersible then slowly rose to the surface, where it finally rested on an even keel.

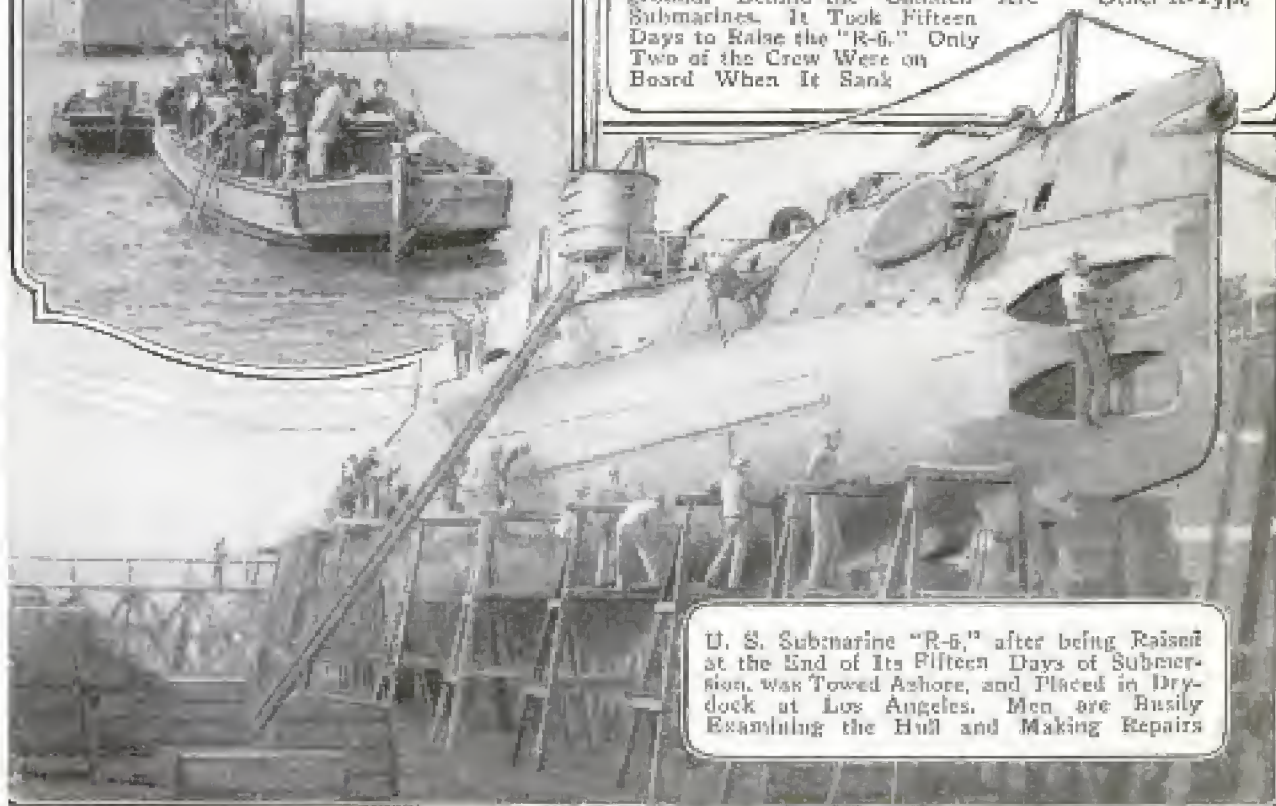
The other mishap was to the "S-48," off Bridgeport, Conn., when this submarine was submerged for 12 hours before the 41 members of the crew, after blowing the water out of some of the ballast tanks, succeeded in raising the vessel's bow above the surface so that they were able to escape through a torpedo tube. Then, perched upon the exposed bow, they waited for 10 hours, until finally they attracted the attention of a passing steamer, and were picked up and taken ashore. Only three of them required medical attention.



Below: U. S. Submarine "S-48," Sank near Bridgeport, Connecticut. The Photo Shows the Exposed Bow of the Submarine from Which the 41 Members of the Crew Escaped through a Torpedo Tube, and were Later Rescued by the Tug Shown Alongside. Left: Wrecking Tug That Rescued the Crew of the Submarine Shown Lashed to the Exposed Bow. At the Time the Photo was Taken a Member of the Crew was Entering the Torpedo Tube through Which the Trapped Crew of the Submarine Escaped



Left: In the Foreground Is the Small Tug Engaged in Pumping the Water Out of the U. S. Submarine "R-6" Which Sank Suddenly While Moored alongside the Submarine Tender "Camden," Seen in the Background. Behind the "Camden" Are Other R-Type Submarines. It Took Fifteen Days to Raise the "R-6," Only Two of the Crew Were on Board When It Sank



U. S. Submarine "R-6," after being Raised at the End of Its Fifteen Days of Submersion, was Towed Ashore, and Placed in Drydock at Los Angeles. Men are Busily Examining the Hull and Making Repairs

MACHINE FOR CUTTING MORTAR FROM JOINTS OF BRICKWORK

A special machine was recently placed on the market which is intended for cutting out the mortar between bricks. It



A Workman Removing Mortar between the Bricks of a Wall with the New Machine: Goggles Protect His Eyes from Flying Bits of Mortar

consists of a small wheel which is operated at 3,500 r.p.m. by a flexible shaft from a 1/4-hp. electric motor. A case, partly covering the wheel, extends down to form a handle, and a safety guard is provided to protect the operator's hands from flying bits of mortar. Wheels of various thicknesses are supplied so that they may be changed to fit layers of mortar of different width.

IMPORTS OF EGYPTIAN COTTON CARRIED IN AMERICAN SHIPS

Exports of Egyptian long-staple cotton to the United States have always been very considerable, exceeded only by those to the United Kingdom. Egypt is still suffering from the effects of the cotton crisis, during which, in the year 1920, there was a decline of price, at normal exchange rates, from \$1.60 to 20 cents per pound. A partial cause of this was a corresponding decrease in the amount of cotton exported, but in spite of that there were shipped to the United States during the first nine months of 1921, over 42,000,000 lb. of cotton. Up to the present, the carrying of these heavy shipments has been a monopoly enjoyed by British liners, and it is therefore gratifying to learn that, on Nov. 16, 1921, a contract was signed between various British steamship companies and the Emergency Fleet Corporation, by the terms of which 50 per cent of all cotton shipments from Alexandria to the United States, whether consigned directly or via British ports, may be carried in American bottoms.

7725 **CONVEYOR UNLOADS AND PILES STONE FOR STORAGE**

An original means of storing stone for future use in concrete work, in connection with highway construction, has been devised by an eastern contractor. A conveyor that carries the stone from the loaded car to the storage pile is supported on cribbing made of railroad ties. This cribbing is added to as the pile of stone increases in height. It is claimed that it is possible to pile about 50 tons of stone an hour in this manner.



Conveyor for Unloading and Storing Stone for Future Use in Highway-Construction Work: The Conveyor is Supported on Cribbing Made of Railroad Ties Which are Added To as the Height of the Stone Pile Increases. It is Claimed That 50 Tons of Stone an Hour can be Piled in This Manner

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7469 Cont. H E Thomas
911 Munchley Ave.
Portland Ore



One Hundred People, the Entire Population of Fort Rock Valley, Oregon, Which Covers 100 Square Miles, Turned Out to the Opening of the Well Which Proved the Desert Valley can be Made a Garden Spot

ABANDONED SETTLEMENT RECLAIMED BY WELLS

BY HORACE E. THOMAS

DEVELOPMENT of a great arid waste that was being abandoned to the sagebrush and the jackrabbit is foreshadowed by an experiment that has been conducted by the state of Oregon. Irrigation from wells is expected to redeem vast stretches of desolate and barren plains. The first well has been completed with money appropriated by the state legislature, and geologists employed to make a survey declare that the whole Fort Rock basin of central Oregon, in which the experiment was made, is underlaid by an abundant supply of water.

When a railroad was built into central Oregon in 1910 there was a great rush of homesteaders attracted by the opportunity. Cabins sprang up over the prairie, and the settlers began to till the soil. But in the Fort Rock Valley, a few seasons completely chilled the enthusiasm with which they had entered upon their pioneering. So parched was the land, so small the rainfall, that even approved methods of dry farming failed to wrest a living from the reluctant earth. No feasible method of irrigation was available, and the discouraged settlers moved away, most of them having lost live stock and other possessions they brought with them. Soon the valley became a district of abandoned ranches, with only a handful of people left—those who were too poor to move away, and a few who still believed in its agricultural possibilities.

So distressing was the situation, that an appeal for help to the state legislature gained an appropriation of \$10,000 to determine whether the land might be irrigated from wells. It was hoped to find an artesian supply, but this was not realized. There was tapped, however, a great reservoir of water at a depth of about 100 ft. below the surface. It lies in a basin formed by layers of hard basaltic lava, and is practically inexhaustible.

When the first well was completed, the people in that part of Oregon were invited to witness a demonstration. There was present the entire population of the Fort Rock Valley, 100 persons, living in a district of 100 square miles, and others from near-by valleys. A turbine pump driven by a tractor raised water at the rate of 600 to 800 gal. a minute. In the first few minutes the surface of the water in the well fell slightly. Then it remained stationary during the six hours that the pumping continued. Although the well was drilled to a depth of 220 ft., the water level was only 25 ft. below the ground. At the average flow of 700 gal. a minute, the well will supply sufficient water to irrigate 200 acres of land and transform it from a barren desert into a garden.

The state authorities who conducted the experiment pronounce it a success in every particular. Sufficient money remains of the appropriation to bore two additional wells, which will be located in

Located in Lake County.

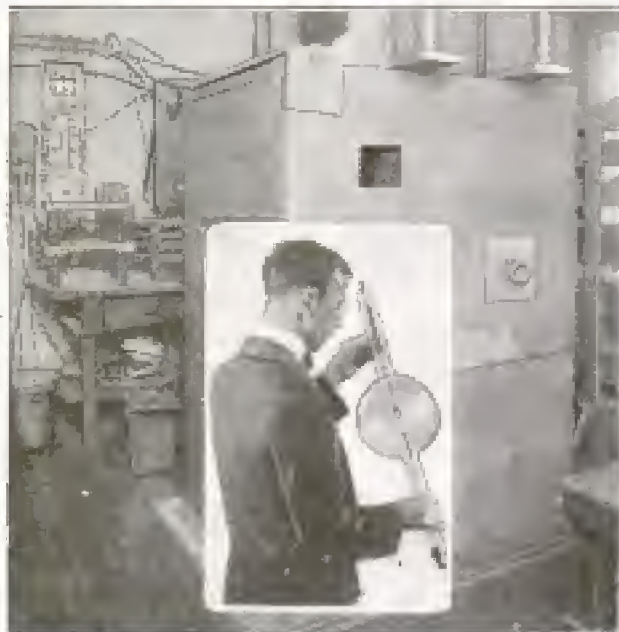
other parts of the valley to prove that the supply is uniform. Then the situation will be left to the resources of the ranchers.

It is expected that many more wells will be sunk and that the desert will be made to bloom, just as it has elsewhere where

gravity irrigating systems have been installed. A day is looked forward to when the deserted farms will be rehabilitated and the owners, freed of the discouragement that drove them away, will return with new hope and confidence in the land that once failed them.

X-RAY TUBES EXPERIMENTALLY OPERATED AT 300,000 VOLTS

Development of X-ray apparatus has reached a more advanced stage in this country than most people imagine. Re-



Laboratory Containing Lead-Lined Cabinet for Testing High-Power X-Ray Tubes: The Insert Shows One of the Recently Built 300,000-Volt Tubes

cently X-ray tubes have been built which operate experimentally at 300,000 volts. These are among the highest-power tubes ever constructed. The test of these instruments is a delicate and dangerous task. In conducting the test, the operator stands within a lead-enclosed cabinet from which he can observe the behavior of the tube.

RECORD OF POWER RESOURCES KEPT BY WAR DEPARTMENT

As a war-preparedness measure, the engineering division of the War Department has decided to compile and maintain an inventory of all available electric-power resources of the whole United States. This will be done by the coöperation of all the power-producing concerns in the country, who will furnish the engineers of the War Department with information of the maximum output which

can be maintained by each of their plants, and of the power uses, and the needs of the large power consumers, in each district. It will also be ascertained to what extent each district is surveyed for development of increased power resources, so that the government will know the best means of developing these resources, and of administering the distribution of power in case of war.

INSTRUMENT UPON DASHBOARD GIVES WARNINGS TO DRIVER

Located on the dash of an automobile, a recently developed instrument, by flashing red lights in three small windows, shows the driver when the oil in the crankcase gets too low for safety, when the water in the radiator is approaching the boiling point or the freezing point, and also when the level of gas in the reservoir reaches any minimum for which it is adjusted. Thus the auto driver is provided with a positive warning against burnt-out bearings from lack of oil, against delay because of gas shortage, against overheating of the engine, and against damaging the radiator by frost.



Three Small Windows on Auto Dash, in Each of Which a Red Light Flashes, Warning the Driver of Lack of Oil, Gas Shortage, or Overheating of the Radiator

Electrical World
12/17/21

Selometer Mfg. Co.
Birmingham, Ala.

General Electric Co. Schenectady N.Y.

Selometer Mfg. Co.
Birmingham, Ala.

N.Y.

Auto Care

VENTILATION PROBLEMS SOLVED IN TEST TUNNEL

By S. R. WINTERS

*402 21st St. N.E.
National Bank Bldg.*

IMMUNITY from ill effects of carbon monoxide—a poisonous constituent present in gases discharged by exhaust systems of automobiles and motor trucks—when operating vehicles through a tunnel, is assured if persons are not exposed to more than 4 parts of carbon monoxide to 10,000 parts of air. This is the outstanding conclusion of a series of tests completed on November 1, last year, in a test tunnel constructed by the Bureau of Mines in connection with its experimental mine at Bruceton, Pa. Coöperating with the New York and New Jersey State Bridge commissions, the bureau built an experimental tunnel to study ventilation problems when au-

tomobiles operate underground. The results of the investigation are particularly applicable to the regulation of air ade-

Washington, D.C.



Air-Sampling and Temperature-Measuring Station at Entrance to Experimental Tunnel: Forty-Eight Samples from Different Parts of the Tunnel are Taken to This Station for Testing. Temperatures in All Parts of the Tunnel are Measured



Taking a Sample of the Gas from the Exhaust Pipe of One of the Motor Trucks Used for Making Observations in the Experimental Tunnel: There Were Several of These Trucks in the Tunnel, Each Carrying the Driver and at Least One Observer

quate to the use of the 9,000-ft. tubes to be used as traffic passageways between New York City and New Jersey under the Hudson River.

The underground roadway is located on the outskirts of Pittsburgh. It consists of an oval track, tunneled under the surface of the ground. It penetrates 130 ft. below the ground and is situated 1,050 ft. from the pit mouth of the mine. The axial length of the track is 400 ft., with a cross section 9 ft. wide and 8 ft. high. Above the ceiling of the tunnel is an air duct, 3 ft. high, and below the floor is a like unit, 2½ ft. high. Both of these ducts either introduce fresh air or discharge foul or poisonous atmosphere.

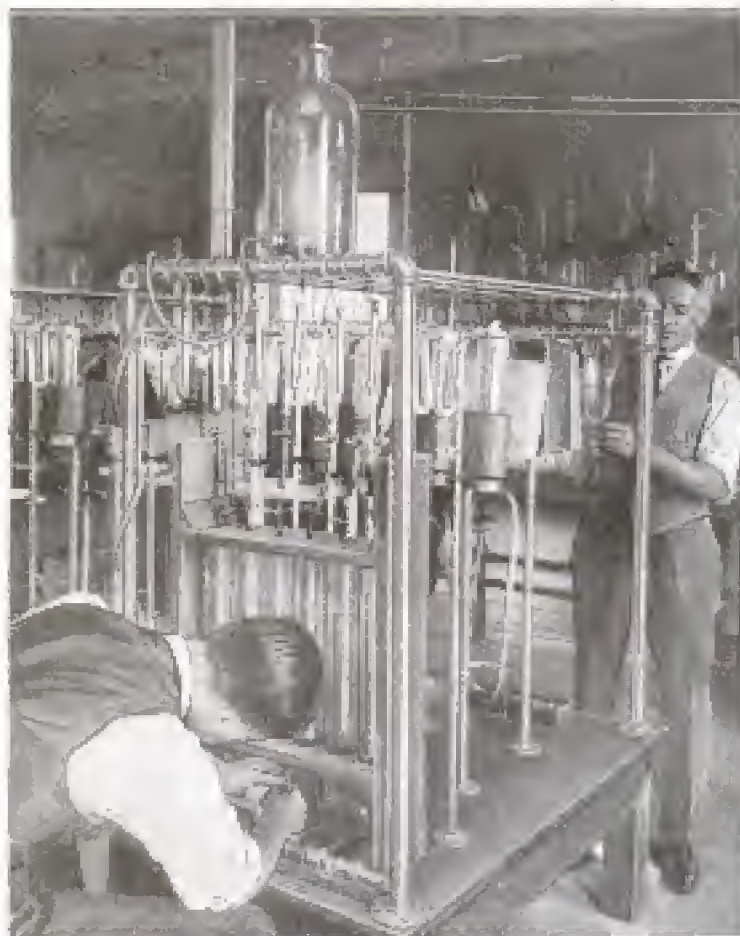
Elaborate and sensitive apparatus is found in the experimental tunnel, including units for determining the temperature, humidity, volume, rate of flow, and pressure of the air in all sections.

Forty-eight air-sampling tubes, placed along the tunnel, form a complete equipment for obtaining samples of air for chemical analysis, and for determining the spreading and concentration of the exhaust gases in various por-

tions of the tunnel, under different methods of ventilation. A car collecting samples of atmosphere is continuously in operation through the tunnel while observations are in progress. Fresh air is introduced through horizontal slots in expansion boxes near the floor of the underground track. Impure air is discharged through a center opening in the ceiling. Physicians periodically take blood samples from the arms of the drivers of automobiles to ascertain the percentage of carbon monoxide absorbed by the blood.

Eight lightweight automobiles, spaced at 50-ft. intervals and operating at a speed of 10 miles an hour, were used in the observation tests. From 21,000 to 28,000 cu. ft. of air a minute, or a volume sufficient to maintain a ratio of 4 parts monoxide to 10,000 parts of air, was forced through the underground oval

track. Each driver and observer participating in the tests was subjected to examination before and at the conclusion of the performance by physicians and physiologists. The quantity of carbon monoxide absorbed by each participant in the experiments was revealed by examination of drops of blood extracted immediately after the tests. Sensitive apparatus for making these blood analyses was developed by the Bureau of Mines. The influence of smoke and temperature on the drivers of the automobiles was determined also. The improvised tunnel has a constant temperature, free from fluctuations and leakages common to models built above the surface of the earth, and the



Apparatus for Making a Chemical Analysis of the Experimental-Tunnel Atmosphere in Order to Determine the Percentage of Carbon Monoxide

ground temperature surrounding it approximates that underneath the Hudson River. The air was heated and humidified as representative of an extreme condition during the final observations.

Each automobile transported a driver and from one to three observers. From two to ten other observers remained stationary or walked alongside the passageway in an effort to check the accuracy of the preliminary tests. Thus sometimes as many as 42 persons submitted themselves to the influence of the gas given off by the automobiles for a period ranging from one to two hours. Air was introduced from varying angles—at the bottom and top of the ventilation system—to find out the method yielding the most efficient ventilation at a minimum air circulation. Purposely, the engines of the cars were so adjusted as to yield a substantial volume of smoke. The result was without variation, that the smoky exhaust ascended behind the automobile



Surgeon Taking Sample of Blood from Arm of Driver of One of the Test Cars After He had Driven the Car One Hour in Experimental Tunnel

toward the ceiling. Upward or downward ventilation produced this effect invariably. Presence of considerable smoke in the tunnel was a condition readily met by stopping the automobiles.

From the results of these observations, the investigators are unanimous in the conclusion that no ill effects will be sustained by persons exposed to carbon monoxide in the dilution stated above. Earlier experiments with both animals and men at the physiological laboratory of Yale University, under the direction of Dr. Yandell Henderson, consulting physiologist of the Bureau of Mines, had established this ratio of carbon monoxide to air as being safe. This conclusion is applicable to mines and blast furnaces as well as to vehicular tunnels. An increase in humidity and temperature to 88° F., as measured by the wet-bulb thermometer, did not influence the results as far as causing bad effects is concerned, although subjects were exposed for one hour 10 minutes. This figure represents the maximum heat and humidity that could possibly occur in the Hudson River tunnel.

The results of the study of the Bureau of Mines may be accepted as final. The tests were planned as checks on the conclusions arrived at in the investigations

at Yale University just referred to and that of the University of Illinois relating to the volume of fresh air necessary to the functioning of the Hudson River tun-



Reading Temperature and Humidity in Atmosphere of Tunnel: Fresh Air is Admitted from Openings Near Floor, and Vitiated Air is Removed through Opening in Ceiling, or Vice Versa

nel. Road tests on 101 automobiles and motor trucks at the Pittsburgh Experiment Station likewise revealed the percentages of carbon monoxide discharged by individual vehicles. The range is from .5 to 14 per cent. Passenger cars and speed motor trucks operating on level grades at 15 and 20 miles an hour averaged 7 per cent; motor trucks ranging from 1½ to 5-ton capacity, traveling at a rate of 10 miles an hour, 7.3 per cent.

7709
CHAIR-BED HAS BOOKSHELF AND MEDICINE CABINET

Invalids, book lovers, and smokers should be interested in a new reclining chair, which

combines a number of features. A small compartment in the side can be used as a medicine cabinet, or to contain the smoker's needs. Between the front legs is a shelf for holding books, and to the right arm can be fitted a detachable writing table.

Besides these advantageous points, the chair has the additional feature of being convertible into a bed, so that it is a useful piece of furniture not only in the daytime but also during the night.



Left: Chair-Bed Showing Bookshelf. Right: Chair-Bed Showing Cushion Unfolded, Medicine Chest and Writing Table

Ans. Ed. Spector 503 Ashford St. Brooklyn, N.Y.

7774

DRAWERLIKE SEAT SLIDES INTO SIDE OF AUTO BODY

An extra seat, which pulls out of the side of the car body like a drawer, is a feature of one of the latest-model run-

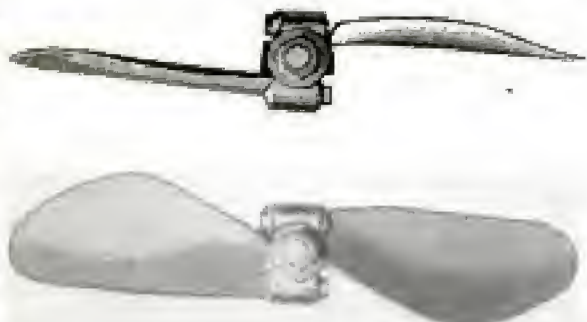


When Pulled Out, This Drawer Forms a Comfortable Extra Seat. At Other Times It Fits Neatly into the Side of the Body of the Car

bouts. The back and armrests fold into the drawer, which is entirely out of the way when not in use. For the comfort of the occupant, a short running board is provided, a section of which is hinged so that it can be raised to form a footrest and brace.

PROPELLER MADE ADJUSTABLE FOR WIND OR MOTOR DRIVE

Ordinarily a propeller on a sailing vessel possessing an auxiliary engine, would prove to be a hindrance when the engine is not in use, but an adjustable-bladed



Above: Adjustable Propeller Aligned with Course of Ship When Sails are Used. Below: Position of Propeller When Engine is Used

type has been introduced, which automatically adjusts itself so as not to be a "drag" on the boat when idle. The blades of this propeller turn loosely in a bearing on the shaft, and when sails are used, the blades revolve in the bearings until their edges are alined with the ship's course, in much the same manner as a weathervane adjusts itself to the wind. When it is found desirable to employ the engine, the revolving of the engine shaft brings the blades back to their original position again, for the purpose of propelling the boat.

POSSIBLE SOURCE OF SUGAR PRODUCTION DISCOVERED

Sugar may be obtained from a new source as a result of a recent discovery made by the United States Department of Agriculture. It has been found that a substance, known as inulin, which has a 60-per-cent greater sweetening quality than the sirup made from sugar cane, can be extracted from the tubers of the



Left: Flowers, Leaves, and Tubers of the Jerusalem Artichoke. Right: The Tubers, Showing How They Grow on the Roots of the Plant

Jerusalem artichoke, a plant related to the common sunflower. The discovery is so new, that so far it has been impossible to make complete tests of the commercial possibilities of this plant as a source of sugar. The plant is most prolific, however, needing only to be planted once, after which it reproduces itself each year. In fact, it is considered a pest in some parts of the country. In the past these tubers have been used for making pickles by saturating them with vinegar. The Jerusalem artichoke is a native North American plant and was used as a food, by the Indians, before the coming of white men.

U.S. Dept. of Agriculture
 Bureau of Plant Industry
 Washington, D.C.

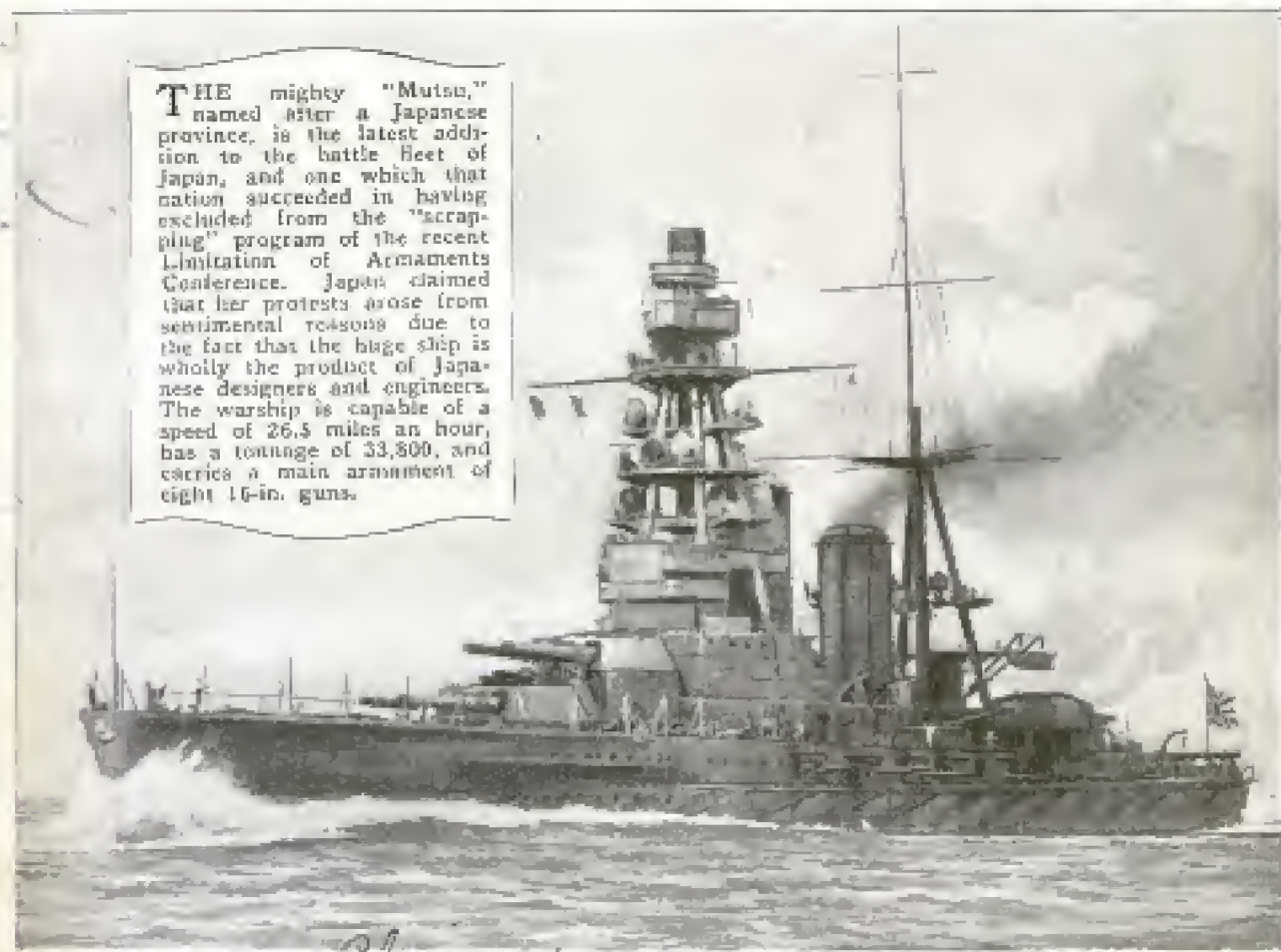
S.A. Winters, 702 District
 National Bank Bldg.
 Washington D.C.

Cont. E. Wiers, 80 Boulevard Gaudan,
 Paris, France

7988

MIGHTY "MUTSU" IS LATEST JAPANESE BATTLESHIP

THE mighty "Mutsu," named after a Japanese province, is the latest addition to the battle fleet of Japan, and one which that nation succeeded in having excluded from the "scrap-pling" program of the recent Limitation of Armaments Conference. Japan claimed that her protests arose from sentimental reasons due to the fact that the huge ship is wholly the product of Japanese designers and engineers. The warship is capable of a speed of 26.5 miles an hour, has a tonnage of 33,800, and carries a main armament of eight 16-in. guns.



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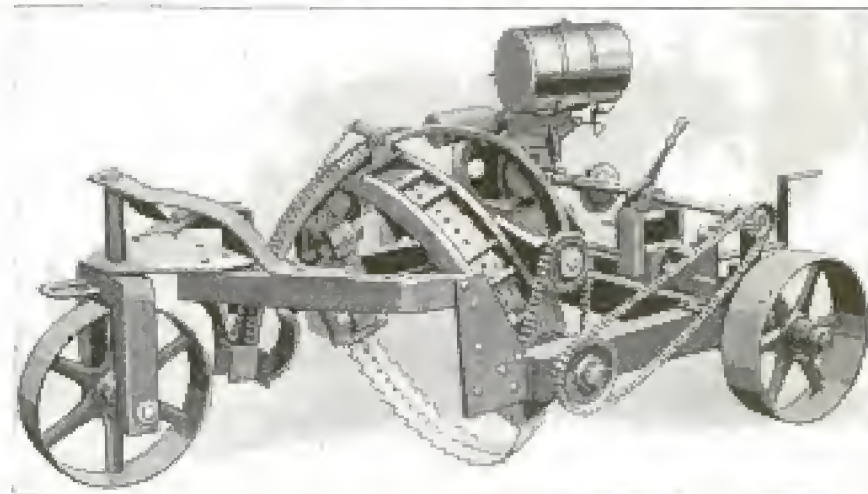
Chicago

7338

POWER-DRIVEN STUMP CUTTER DOES ITS WORK RAPIDLY

Tree stumps can be cut off at ground level, or as much as 30 in. below, very rapidly by a machine that does the cutting with a sort of combined band and circular saw, for though it is flat, like a band saw, it is $\frac{5}{8}$ in. thick, and maintains its circular shape. The saw is rotated rapidly by a small gasoline engine, and when cutting below ground, it is started some distance from the stump, and is sloped and fed downward so that it descends into the ground and strikes the stump at the desired depth. After cutting through the stump the slope of the saw is reversed, and it proceeds to cut upward, ending by having cut out a

saucer-shaped section of the ground containing the tree stump. The saw is made of the same material as stone-cutting saws. The machine is mounted on wheels, making it easily portable. It is made in



Machine for Cutting Tree Stumps at Ground Level, or 30 Inches below It: The Circular Band Saw Cuts through the Stumps While It is being Rotated Rapidly by the Small Gasoline Engine at the Rear.

two sizes, with saws of 8 and 12 ft. diameter, respectively.

Spiral Machinery Co.
H 21 - Arcade - Colden

St. Louis, Mo.
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Brady, East St. Louis, Ill.

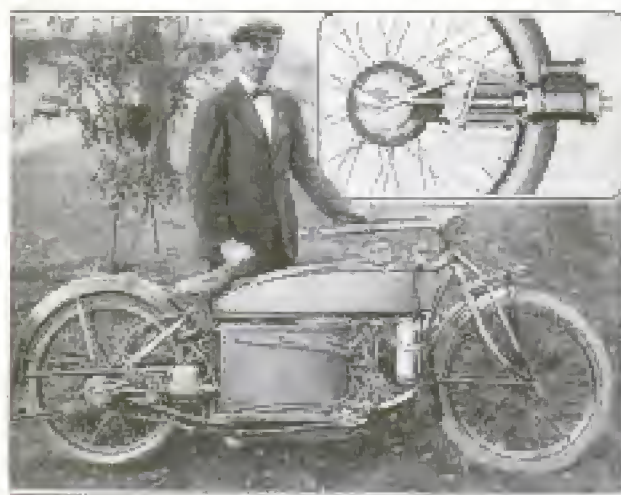


Operating the Machine for Carving Reliefs from Photographs: The Drill, an Enlarged View of Which is Shown Above, is Guided by the Aid of a Microscope along a Spiral Line on a Special Photographic Print, Similar to the Groove in a Phonograph Record



STEAM-DRIVEN MOTORCYCLE ECONOMICAL TO OPERATE

An economical steam-driven motorcycle has been built by a Denver, Colo., man, and as there are no gears, chains, belts, or clutches, it is practically noiseless. The inventor claims that the machine develops a speed of 60 miles per hour from a standing start, within a distance of 174 ft., and that 1 gal. of kerosene furnishes sufficient steam to travel 35 miles. The driving power is applied directly to the axle of the rear wheel, by a two-cylinder single-expansion double-acting engine. It is estimated that the steam machine can be operated at one-fifth the cost of a gaso-



Steam Motorcycle Showing the Kerosene and Water Tanks and Various Piping. Insert: Engine and Eccentric on Rear Axle

line motorcycle, not including the saving in tires due to the smooth, even application of power.

"PHOTO SCULPTURE" CARVES RELIEFS FROM PICTURES

At the Royal Photographic Society exhibition, in London, Eng., a demonstration was recently made of a process of "photo-sculpture." The subject to be photographed is illuminated by a projector which throws a spiral of light, similar to the groove in a phonograph record, upon it. This spiral is distorted, on the negative, by the irregularities of the subject. A positive is made, on glass, to be used in the carving machine. This has a disk, to hold the material to be carved, a carrier for the photographic record, and a microscope and high-speed drill, mounted together. The operator moves the microscope so that the cross hairs follow the spiral lines of the photograph. This moves the drill so that it cuts the material at varying depths according to the form of the subject. In this way excellent reliefs have been obtained in wood, ivory, and alabaster.

RATTLESNAKES ARE KILLED WITH WAR POISON GAS

Mustard gas has been employed by the Department of Agriculture to aid in the extermination of rattlesnakes in the state of Washington. The experiment consisted of forcing the gas into a bed of lava rock, which had hitherto proved to be an invulnerable retreat for the reptiles. Soon there appeared snakes of all sizes, dazed and blinded, in which condition they were quickly clubbed to death.

Chicago

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Reel Agency, 152 Reel
D. E. C. London, England
Scientific American Dec. 1911
9/12/11

STREET WIDENED TO RELIEVE —CONGESTION IN CINCINNATI

Widening the intersection of Freeman and Western avenues with Liberty Street, in Cincinnati, Ohio, will relieve one of the most seriously congested spots in the city. Liberty Street is so narrow that it has been impossible for cars to turn north into Western Avenue while a car was turning south into Freeman Avenue. There was barely clearance for one car to turn at a time, and automobiles were compelled to wait until all cars had passed the corner. This corner is only three blocks from Redland Field, the home of the Cincinnati National League baseball team, and during the ball season especially the traffic is heavy. The city has purchased and torn down several buildings on the

corner of Liberty Street and Freeman Avenue, which will be one of the broadest in the city when the work is completed. The change will greatly simplify traffic problems.

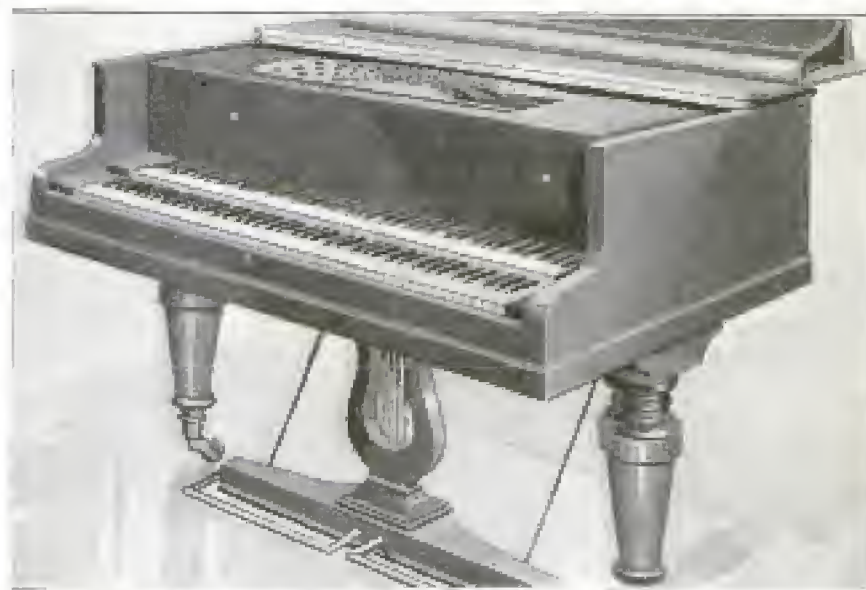


This Intersection Was So Narrow That One Street Car Turning the Corner Blocked All Other Traffic. Buildings have been Torn Down, and the Corner is being Widened. It will Be One of the Widest in the City

DOUBLE KEYBOARD IN PIANO— SIMPLIFIES THE FINGERING

By a rearrangement of the conventional piano keyboard several attempts have been made to make the fingering easier. One of the most recent is a double keyboard, the production of a Belgian inventor, which has attracted a great deal of attention among musicians, and which is said to be a decided improvement of the existing single keyboard. It simplifies the study of the piano, and at the same time makes possible a wider range of scale combinations and harmonies. The upper key is a half tone above the lower one. On the new keyboard the same fingering is used to play the major and minor scales. Modern piano compositions are easier to play, and the new keyboard permits the creation of

many new effects and combinations that would be impossible on the conventional keyboard. The construction of the double keyboard is extremely simple, and it can be adapted to any type of piano, old



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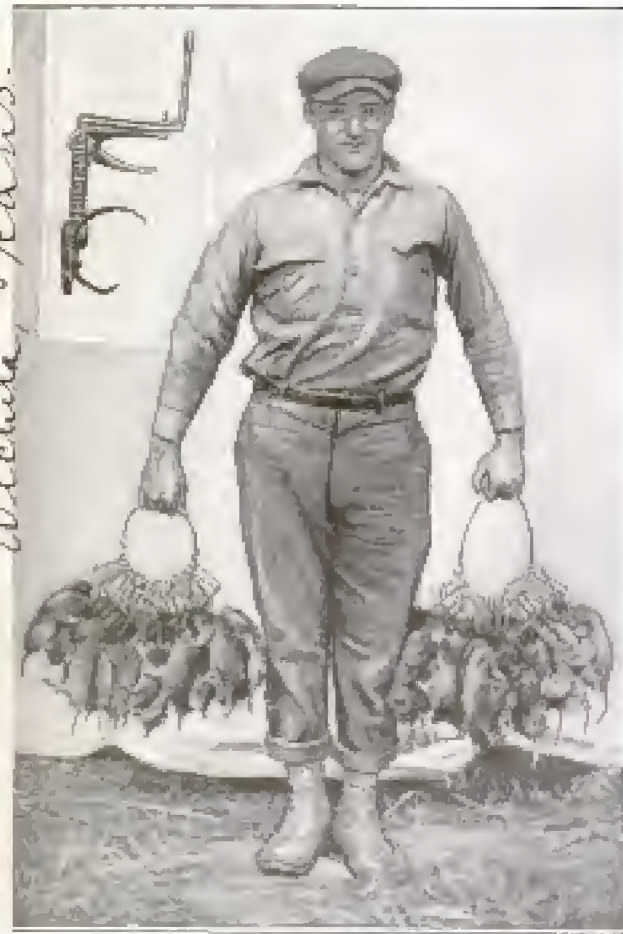
Double Keyboard, the Production of a Belgian Inventor, Which Facilitates the Study of the Piano, and Makes Possible the Playing of Effects and Combinations Impossible to Play on the Ordinary Single Keyboard

or new, without necessitating interior changes of any kind.

Agent: *Cmt Maurice & Belgrims*
Antwerp Belgium 35 Place de la Gare

**NEW TYPE OF GOPHER TRAP
 MAKES RECORD CATCH**

In farming districts where the eradication of gophers is necessary to profitable



A Single Night's Catch of 102 Gophers, from a Set of 114 Traps: The New Gopher Trap, Which was Used, is Shown in the Insert

production of crops, a gopher trap which will catch 102 gophers in a single setting of 114 traps, should prove of great value. That is the record of a new type of trap, which seems to succeed where many previous inventions have failed. When a gopher finds light entering its run, it im-

mediately plugs the hole by pushing dirt into it. This trap is set in such holes. The dirt passes over the trap, but, when the animal's nose touches the trigger, the jaws instantly close on its body.

8026

**GERMAN MERCHANT MARINE
 SHOWS ENORMOUS GROWTH**

During the last half of 1921, the German merchant marine has shown a phenomenal growth. The present total is from 850,000 to 1,000,000 tons, an increase of about 250,000 tons since July. At present the German shipyards are intensely busy turning out additional vessels. This activity has been stimulated by the action of the government to withhold indemnities payable to shipping interests for vessels delivered to other countries, under the terms of the treaty of Versailles, unless new vessels are built to replace those lost. In spite of the increase in available tonnage, 80 per cent of Germany's foreign shipping is being carried in foreign bottoms. About three per cent is handled by American ships.

7741

**INGENIOUS EMBLEMS SEEN
 AT FOOTBALL GAME**

As usual, the rivalry between the universities of Indiana and Purdue called forth great enthusiasm at the annual football game, played at Bloomington, last fall. One of the features of the celebration was a prize contest for emblems displaying the spirit of the Indiana team and its coach, "Jumbo" Stiehm. Many novel ideas were represented, the favorite being a play on the name of the popular Indiana coach, in the form of an Indiana "Stiehm" roller. The preliminary enthusiasm was turned into a real celebration by a 3-to-0 victory for the Indiana team.



Some of the Clever Emblems at the Indiana-Purdue Football Game, the Past Season, Took the Form of an Indiana "Stiehm" Roller



Cont. Will Peterson, 116 N. Grant St
 Bloomington, Ill.
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Mr. The Eleventh Klutch Trap Co. 423 N. Water, Wichita, Kans.

reph. of Commerce 12/17/21

AN EXCITING MOMENT IN AN ICEBOAT

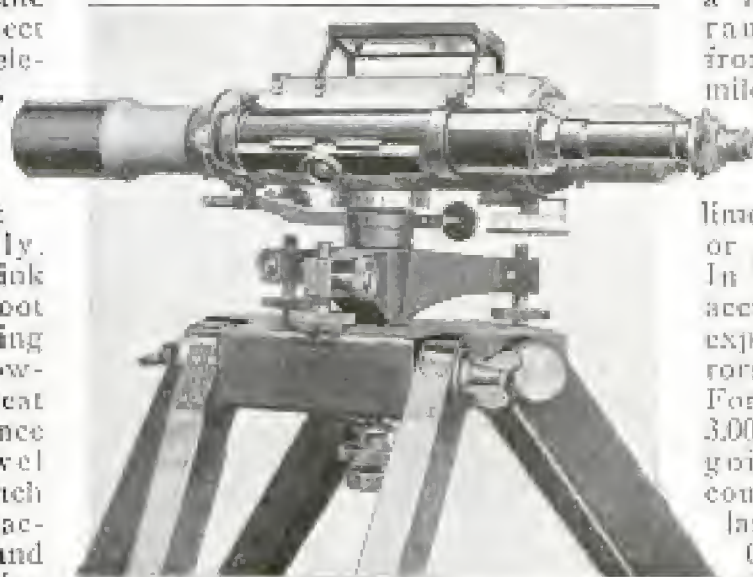
SUCH dangerous tips are common experiences in ice boating, where every shifting puff of wind offers the possibility of new sensations to the pilot of the light craft, which skims over the surface of the ice at a speed greater than that of the fastest trains. This photograph was taken on one of the frozen inlets near Stockholm, Sweden, where ice boating is a favorite sport throughout the long winter season.



PRECISION LEVELING AND ITS PRACTICAL VALUE

BY C. A. BRIGGS

IF a person stands where he can get a clear view of a point a mile away and tries to estimate the position of an object having the same elevation as himself, he will find, first, that it is hard to reach any conclusion at all, and secondly, that he cannot think of an error of a foot in a mile as meaning very much. However, it is of great practical importance to establish level lines to a very much greater degree of accuracy than this; and the most precise work is done by the United States Coast and Geodetic Survey, which prepares the most accurate maps obtainable, showing elevations, for all sections of the country.



Precision Level Used by the United States Coast and Geodetic Survey Which Is Remarkably Accurate

The precision-level lines established by this institution form a network of over a hundred circuits ranging in length from 100 to 4,700 miles. The average closing error of these circuits is less than .2 millimeter per kilometer or .013 in. per mile. In long lines greater accuracy than this is expected, as the errors tend to cancel. For a distance of 3,000 miles, as in going across the country from the Atlantic to the Pacific Ocean, the error should be less than two feet, a proportionate error which would be negligible in any elevation survey made for practical application. A person on the Pacific coast who

built a sea-level landing at a height established by running a line across the country and over the mountains from the Atlantic Ocean, instead of having his shoes at the water level might possibly find himself in water up to his waist or knees, but it is probable that his nose would be safely above water.

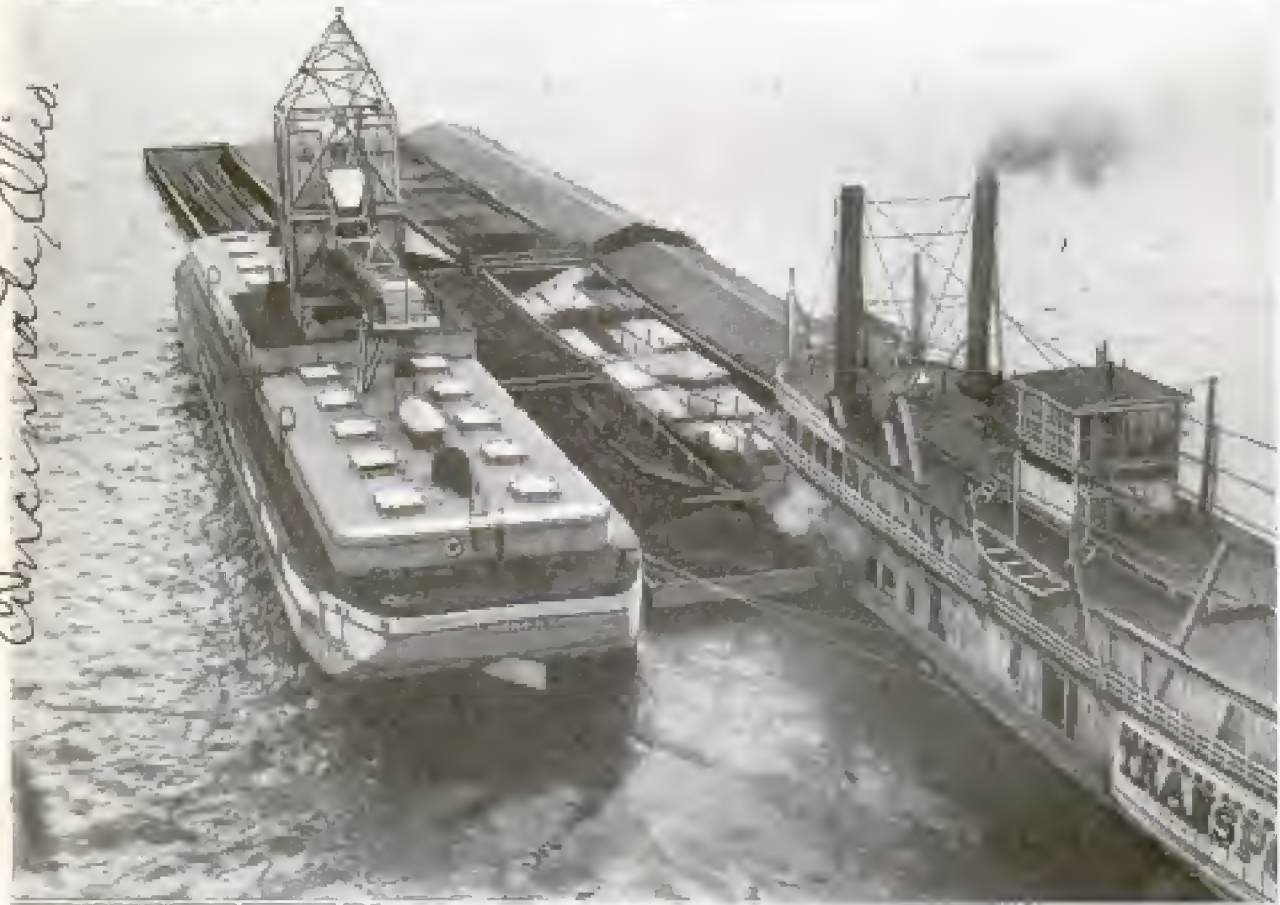
The longest sight that is taken is not more than 150 meters, which is just about 500 ft., or practically one-tenth of a mile. If it were unnecessary to take shorter sights, so that there were but ten to the mile, five forward and five back sights, an uncompensated error of .001 in. consistently made one way, on each sight, in observing at the 500-ft. range, would, in running 3,000 miles across the country, grow to be 30 in. Instruments and methods which will carry level lines without picking up and perpetuating a small uncorrected error of .001 in 500 ft. will be admitted by the ordinary person as something of a refinement.

Accurate level lines are of vital importance when it comes to the drainage of swamps, where a fraction of a foot may determine whether or not a large area can be caused to drain by certain methods. It may determine whether the swamp can be drained into a river, or whether the river will drain into the swamp—rather important information to persons concerned in projects of the kind. Accurate level lines also determine the elevation of permanent marks which are of great value in mining, and for scientific and technical purposes. In the course of time they will tell what portions of the country are rising or sinking, and will give evidence of what the geological history of the future may be, as well as shed light on the past.

The precision network of level lines thrown over the United States by the Coast and Geodetic Survey, will eventually be filled in by secondary surveys that will establish the level of all points in the country.

7758

BARGES CARRY PITTSBURGH STEEL TO CINCINNATI



FOR the first time in many years a shipment of steel was recently made from Pittsburgh, via the Ohio River, to Cincinnati harbor. The steel was loaded on six barges which were towed by the steamboat "Transporter." From Cincinnati a large ocean-going craft, with a derrick towering 75 ft. above its deck, carries freight by river to the Gulf of Mexico, and across the Gulf to South America. This shipment will be followed by others, and it is expected that this will become a common method of transportation of products of the iron and steel district around Pittsburgh to points beyond Cincinnati, and also to St. Paul.

Used by Jones & Laughlin
Iron Brothers, Cincinnati, Ohio

Joseph S. Bradford, Jones & Laughlin, Cincinnati, Ohio.

7271

Inventor Earle Livingston
 2213 Rancherie St, Santa Barbara
 Calif



One-Room Bungalow, in Which the Owner Employed His Practical Experience as a Boat Builder to Utilize Every Inch of Space to the Best Advantage, without Sacrificing Attractiveness of Appearance

ONE-ROOM HOUSE HAS ROOMS IN WALLS

BY FRANK B. HOWE

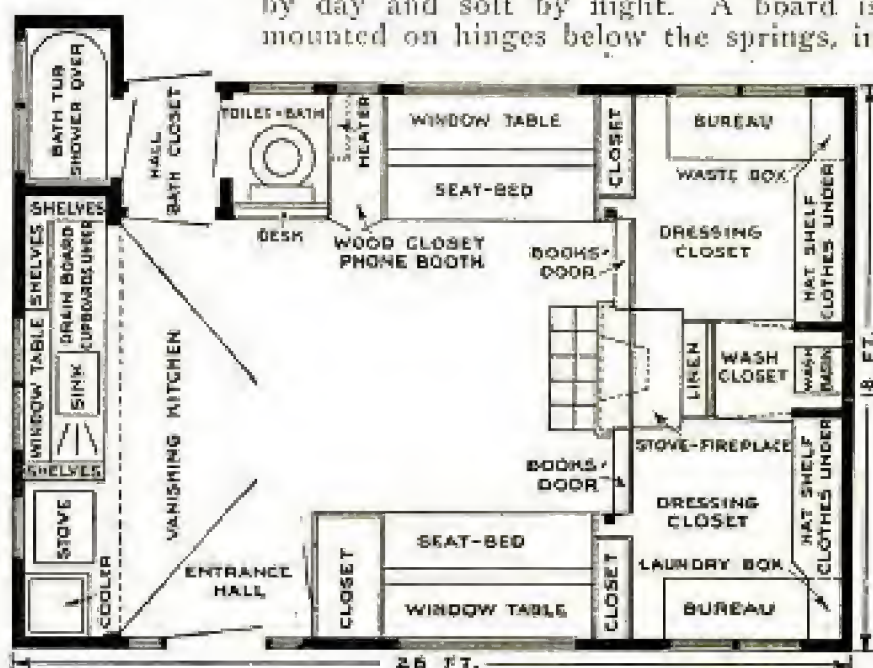
PATENTS have recently been granted on a most unusual miniature house, at Santa Barbara, Calif., which although it is in reality a one-room bungalow, has all the other rooms of an ordinary dwelling concealed in various places about it.

The basic plan of the queer structure is a central room, surrounded by double walls placed from 3 to 7 ft. apart. In these hollow walls are concealed a kitchen, a bathroom, dressing rooms, and other of the orthodox accompaniments of the usual modern home.

The entrances leading from the main central room into the various wall rooms have been concealed so that there is no indication of their existence. When he desires to go into one of them, the owner walks to an apparently blind wall, and, presto, it opens.

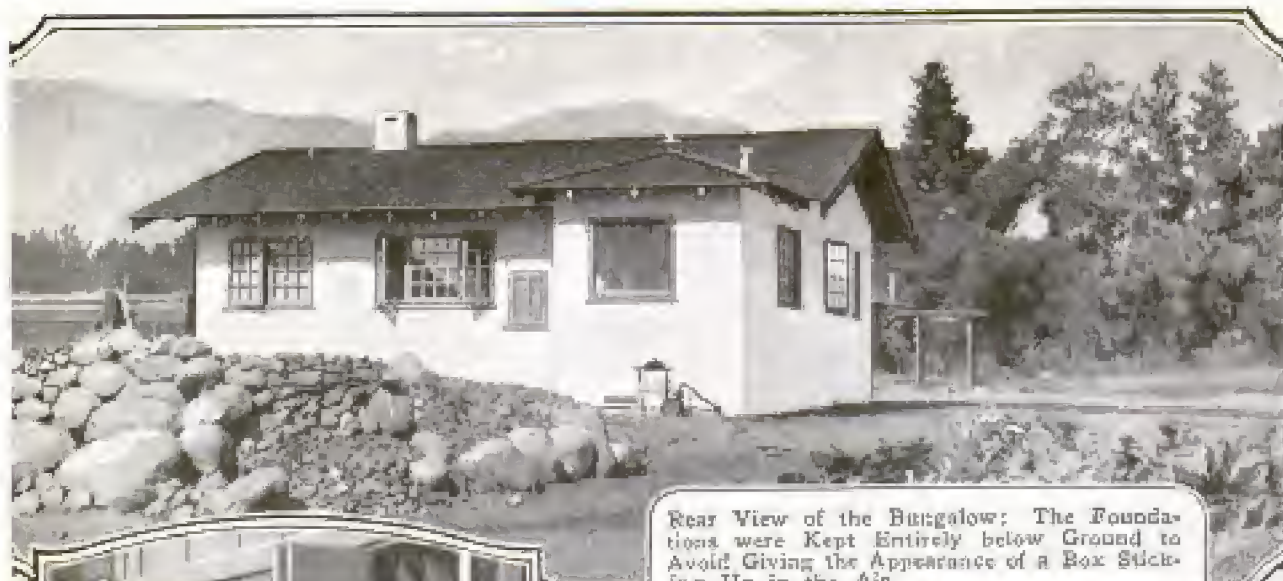
Starting at one end of the central room, the first side opens into a complete kitchen. The next side contains a bathroom, a bed, and several little accessories, such as a wood box, telephone closet, and desk. The third side contains two dressing closets, while the remaining wall accommodates another bed, and also the front entrance.

Special mention must be made of the built-in beds, which can be transformed into window seats. Realizing that a comfortable bed is too springy to be practicable as a seat, and that a comfortable seat is far too hard for a bed, the inventor has devised a plan to make the seat-bed hard by day and soft by night. A board is mounted on hinges below the springs, in

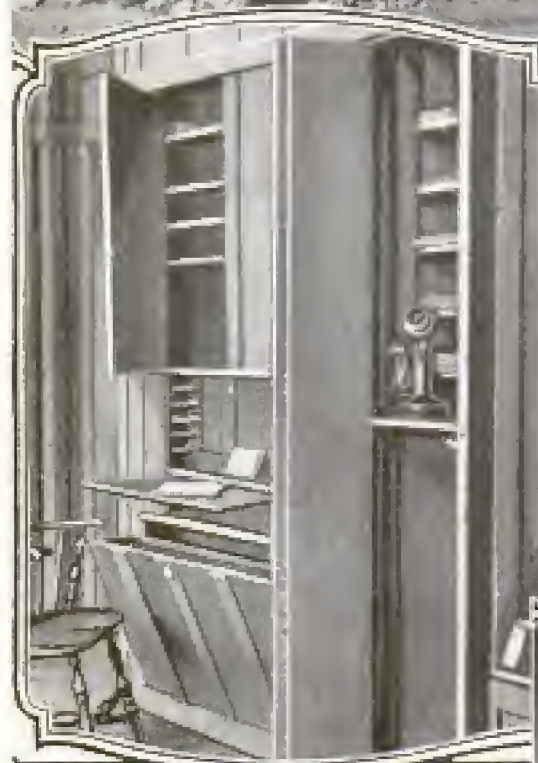


Floor Plan of This Unusual Bungalow, Showing the Ingenious Way in Which a Complete Home was Secured in a Space 18 Feet by 26 Feet, No Larger Than a Single Big Living Room in Many Houses

such a way that it rises, describing an arc, at the pull of a rope. When the seat-bed is to be used as a seat, this board pulls up against the springs, preventing them from acting, and converting the bed into



Rear View of the Bungalow: The Foundations were Kept Entirely below Ground to Avoid Giving the Appearance of a Box Sticking Up in the Air. The Effect of This Toylike House Is Artistic Throughout



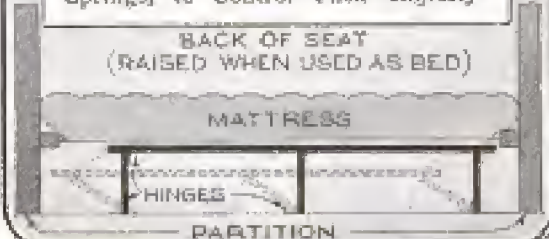
The Paneled Wall at the Right Looks No Different from Any Other Part of the Wall, but It Opens to Give Access to the Furnishings Seen at the Left. Here Are a Telephone Closet and a Desk, with Shelves above It and a Waste Basket Below. There Are Only Three Pieces of Detached Furniture in the House, a Table, Which Serves as a Living-Room and Dining-Room Table in One, and Two Chairs

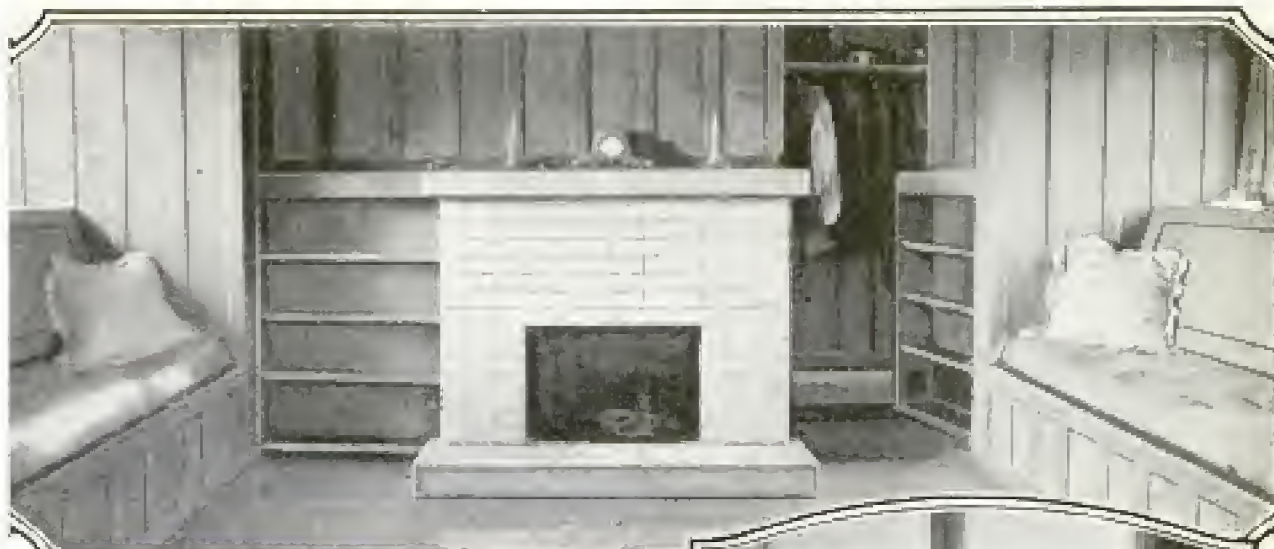


Under Each of the Two Large Windows Is a Comfortable Built-in Seat. At Night, These Seats can be Converted into Equally Comfortable Beds. An Entirely Original Device is Used So That the Springs can be Made More Rigid When Required as Seats, or Given That Additional Resiliency Needed for a Bed



This Diagram Shows the Hinged Support Used under the Seat-bed Springs, to Control Their Rigidity





One End of the Room, Showing the Open Fireplace, the Window Seat-Beds, and the Bookcases, at Each Side of the Fireplace, Which Swing Open to Admit One to the Two Dressing Rooms: The Entrance to the Dressing Room at the Right is Open.

Interior of One of the Dressing Rooms: Each Contains a Hat Shelf, with Hooks Below for Hanging Clothes, a Closet, a Laundry Box, and a Complete Bureau, Built into the Wall. They are Well Lighted by Two Windows Directly over the Bureau.



Another Wall, Above, Which is Apparently Nothing More Than Plain Paneling, is Really Two Doors, Which, When Swung Open, Disclose a Well-Equipped Kitchen, Shown at the Right. The Backs of the Doors are Supplied with Hooks and Racks for Holding Various Utensils. The Kitchen Itself is Only Three Feet Deep, but Contains a Sink and Drainboard, a Full-Sized Stove, a Cooler, and Ample Shelf and Cup-board Space.



a comfortable seat. When the device is to be used as a bed, this board is dropped down, the springs function as usual, and a soft bed is obtained.

With the exception of a table and two chairs, all furniture is built in, most of it being concealed here and there in the blind walls, and coming forth when desired. Everything is built clear down to the floor, to do away with sweeping under the furniture.

The net result of the strange home is

7265 *Chicago Tribune*

ASTONISHING PROGRESS MADE IN MOTORLESS FLIGHT

Restrictions in regard to airplane motors, placed upon Germany by the

that 10 minutes suffice to do the housework each day; yet the residents are fully as comfortable and have all the conveniences of persons living in much larger houses.

At first glance one might criticize the house as being poorly ventilated. Such, however, is not the case. Ventilation has been carefully planned and is ample, through a system of air currents. In fact everything considered necessary in a modern dwelling has been provided for.

men who remained there for further experiments. These flights have aroused great interest, and in France have stimulated similar activity. Flights by Klemperer, Martens, and Harth, of 13, 15, and

21 minutes' duration, respectively, are particularly noteworthy. Though Harth made the longest flight, 15 miles, Klemperer's six-mile flight offered a better opportunity to analyze soaring flight. Such an analysis seems to support the theory that soaring is accomplished by utilizing ascending air currents to attain or maintain altitude, and by gliding between points where such air currents exist. Klemperer flew between two points $2\frac{3}{4}$ miles apart, but, by turning and circling maneuvers, including a complete figure "8," covered about six miles. He attained an altitude fully 400 ft. higher than his starting point.

The method of launching the machines is of interest. It is done in the same manner as a boy throws a missile with a sling shot. The glider is placed on sloping ground, a rope is passed around its undercarriage, and to its ends are attached stout rubber cords, anchored on either side and in front of the machine. Three men pull the machine and the rope backward until the rubber parts are under high tension, when they let go of it, and the glider flies away as if thrown from a catapult. After the launching, the machine continues its flight, at first by the impetus

received and then by manipulation of the movable wing. Experiments have shown that motors of only 3 to 5 hp. would suffice to overcome wind resistance, and thus enable suitably designed gliders to make very long flights. Further developments along this line are expected.



One of the Motorless Airplanes Flying in the Rhön District: This Human Bird Caused Great Astonishment to the Peasants Engaged in Haymaking

peace treaty, have resulted in extensive experiments in soaring flight with motorless planes. Weather conditions during the second annual soaring competition, held last summer in the Rhön district, were unfavorable, but some astonishing and important flights were made by air-

Chicago Trib. 9/3/21

7777

Carl. Hugh Leamy,
of The Sun,
POPULAR MECHANICS

New York City

213



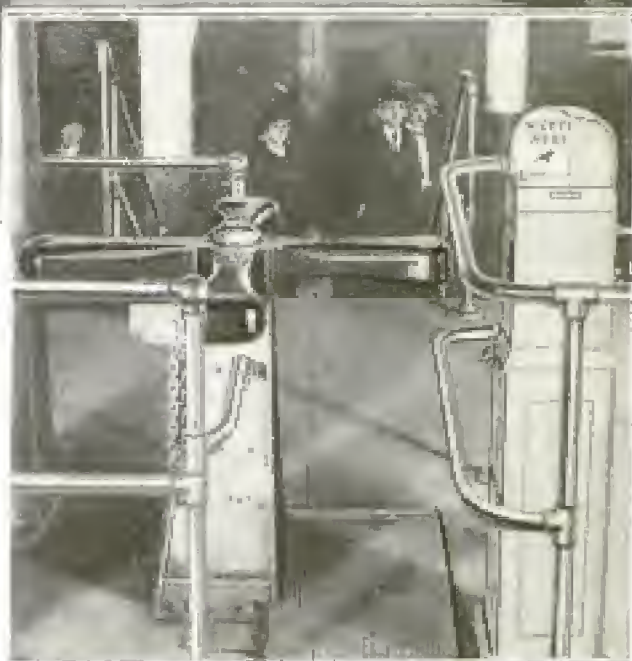
Left: Prospective Passenger Obtaining Change to Drop in the Automatic Turnstile. Right: Passenger Dropping Nickel in Slot to Operate Turnstile

7 "NICKEL-FIRST" TURNSTILES FOR SUBWAY ENTRANCES

Turnstile admittance gates, with attendants watching them, are a common sight, but the spectacle of a gate of this kind operating automatically is a new feature. When a person wishes to pass through the gate, a nickel must first be dropped into a slot on the turnstile, and this coin allows one prospective passenger to enter. Passengers arriving at their destinations can use the gate as an exit, as it turns freely in the reverse direction. One of the subway systems of New York City is conducting experiments with this automatic gate, and if it is found practical, the entire system will be equipped with this type of entrance.

7968 SHAFTING STEEL TESTED TO FIND STRESS LIMIT

Tests have been conducted to determine the fatigue of metals, in which the general problem was to find out what relation exists between the static elastic strength of steel, and its ability to withstand millions of reversals of stress. In making these tests, a large number of



This Automatic Turnstile is Locked, but will Operate Readily if a Nickel is Dropped in the Slot. This Allows One Passenger to Enter

identical pieces of steel were used. A piece was selected, loaded heavily to insure its breaking in a short time, and then rotated until it gave way. With successive pieces, the load was gradually reduced until one piece withstood 100,000,000 revolutions without breaking. The experiments showed that the number of revolutions required for a breakdown increases uniformly as the load is decreased, until a certain load is reached. A slight reduction from this particular load makes it impossible to break the piece, even when run up to 100,000,000 revolutions. These tests have been made under the supervision of the University of Illinois.

Power 12/18/21 P-922

7807
214

Cont. James Mcclintyre,
apartado 370,
POPULAR MECHANICS
Mexico, H. J.

CHIAPAS INDIANS POSE RELUCTANTLY TO CAMERA



In Chiapas, the most southern and probably the least developed state of Mexico, there are 14 distinct tribes of Indians. Each of these tribes has a language of its own, but they all have one characteristic in common. They do not mingle with the white people who live in that part of the country, and it is difficult to learn much about their life and habits. Cameras are mysterious and terrible to them, and it is seldom possible to persuade a native to have his picture taken. There is an unverified but persistent report, among the white inhabitants of Chiapas, that these Indians have some means of communicating across distances of many miles.

Chiapas Indians and the White Men Who Persuaded Them, with Great Difficulty, to Pose for Their Photographs

7748

POWER-DRIVEN CIRCULAR SAW FOR HARVESTING ICE



On a lake in northern Michigan the ice is being cut with a power-driven circular saw mounted on a small bobsleigh. The saw overhangs the rear of the sleigh, and in front of it is a 5-hp. air-cooled gasoline engine with a chain-drive connection. After the saw is started, and has cut its way through the ice, the sleigh is impelled forward and guided by one man. As the saw cuts its own way, this requires only enough force to keep it up against the ice, and in this manner one man can with little exertion do as much work as several with the old crosscut handsaw.

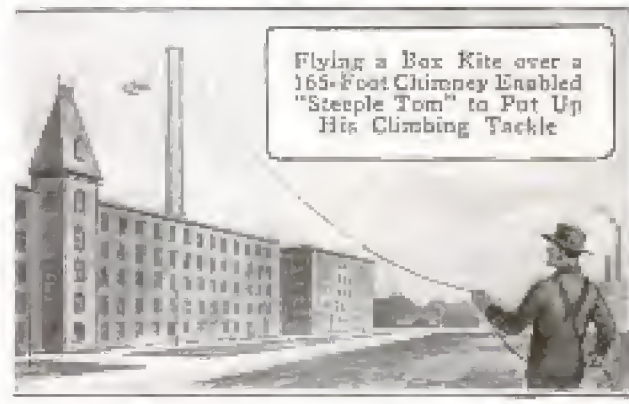
Power-Driven Circular Saw Mounted on a Bobsleigh for Harvesting Ice: The Man with the Pole beside the Sleigh Moves It Forward as the Saw Cuts Its Way through the Ice

7820

STEEPLEJACK CLIMBS CHIMNEY WITH AID OF BOX KITE

With the aid of an ordinary box kite, Thomas Fitzpatrick, better known in New England as "Steeple Tom," recently placed a harness on a 165-ft. brick chimney in Peace Dale, R. I., and raised himself to the top. It was the second chimney he had sealed in this way, and the highest he had ever climbed. By skillful maneuvering, he made the kite graze the top of the chimney and drop to the ground on the opposite side. Then, by the successive raising of cords and ropes of increasing strength, a hook line was

run up, followed by a 1-in. rope and a block and tackle, strong enough to raise him to the top in a chair.



Flying a Box Kite over a 165-Foot Chimney Enabled "Steeple Tom" to Put Up His Climbing Tackle

Putnam House.

And. David H. Colcord.
217 W. Butler St. Lansing, Mich.

341 Tremont St.
Boston Mass.

7727 Cont. P. O. Spitzfaden, Box
309, New Orleans, La.
POPULAR MECHANICS
Block Board of New Orleans

215



Steamship "Emergency Aid" being Loaded with 550 Tons of Coke at the New Coal-Handling Plant at New Orleans, Louisiana, Operated by the Board of Commissioners of That Port

NEW COAL-HANDLING PLANT AT NEW ORLEANS

There was recently put into service a new coal-handling plant at the port of New Orleans, La. The plant is for the purpose of unloading coal or coke from railroad cars, or barges, on the Mississippi River, and transferring it to steamships. The coal pile in the yard has a capacity of 25,000 tons, and to or from this a conveyor carries the coal to the boat and barge docks, where there are three loading towers, with a maximum capacity of 1,000 tons an hour, that can load three ships simultaneously, and one unloading tower for taking the coal from barges. Two of the loading towers travel along a track so that they can discharge directly into the ships' hatches, and the unloading tower at the barge dock is also of the traveling type.

NEW SIGNAL GIVES WARNING OF ALL AUTO MOVEMENTS

Six distinct signals are provided by a new auto-traffic signal device. It consists of a front and a rear signal mounted on the fenders and equally visible by day or night. The front signal indicates to the traffic officer or pedestrian, by means of arrows, the intention to turn right,

turn left, slow down or stop, and go forward or park. In the same way the rear signal warns the driver of any machine following. Stop and slow-down signals are operated automatically when the brake is applied. The other signals are operated by a toggle switch on the steering column. Attention is attracted to the signals by an automatically operated rear horn which can be cut out by means of a switch.



This All-Purpose Signal Shows the Officer That the Driver Intends to Turn to the Left

Automatic Safety Traffic Signal Co.
940 Syndicate Trust Bldg. St. Louis, Mo.



The Railroad, along the South Bank of the Columbia River, was Less Affected by the Snow Slides Than the Columbia River Highway, Which Runs Closer to the Mountainside, but in Places the Drifts Were 25 Feet Deep, and It Took a Week to Dig Out Seven Trains Which were Snowed In

COLUMBIA RIVER HIGHWAY ICEBOUND

By H. E. THOMAS

*911 Lunchley Ave.
Portland, Ore. 97207*

SNOW and ice recently buried the lower Columbia River district in the worst storm that western Oregon and Washington have known in many years. It came on so suddenly that travelers were caught unawares. Automobiles and trains were snowbound, and the famous Columbia River highway was buried by a combination of drifts and slides.

On the edge of Portland, and east of that city for 20 miles, there was an "ice storm," known locally as a "silver thaw." Western Oregon has such storms about once in five years. The heavy rain froze as it fell until poles and wires were carried down in tangled masses, and trees broken and overturned. More than 11,000 telephones were put out of commission in Portland, and communication with other cities was cut off. Entire orchards in the storm zone were ruined.

In the Columbia River gorge there was a snowstorm of great severity. Tourists and pleasure drivers along the highway were forced to leave their cars to the elements and flee for safety. Some of them sought shelter in homes and hotels along the highway, while others caught the last train that was able to get through to Portland before the tie-up.

Parts of the highway are buried under slides as much as 30 ft. deep. Bridges were carried out and great masses of snow and ice came down the mountainside. At first, trucks and snowplows tried to clear the roadway, but found it an impossible task. The western end of the highway was cleared for some distance, but along the river the drifts and slides were so deep that it was concluded the job was not feasible, and that it would probably be necessary to wait until the spring thaw before parts of the highway could be opened.

More than 100 automobiles were stranded along the boulevard. Some of them were later rescued and taken away on trains and boats. Others, however, are completely buried under snow and ice, and are probably marooned for the winter.

Seven passenger trains were stalled on the railroads on the north and south banks of the Columbia. The passengers, after several days, were rescued on river boats sent out from Portland, and were none the worse for their experience. It was a week before the tracks could be cleared and the trains taken out. The railroad was not so seriously blocked as

Republic of China
10/11/21
108 Park Road, New York City



Near Portland There Was No Snow, but an "Ice Storm" Left the Country as Shown Above, with Telephone Poles Down, Trees Broken, and Orchards Ruined. Where the Snow Fell, Drifts Almost Covered Telephone Poles, as Seen Below. This View Also Shows a Path from a Train, to Take the Passengers to a River Boat

the highway, because it is farther from the mountainside and was therefore less affected by the slides.

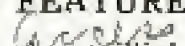
Merchants of Foochow, China, have formed a \$300,000 irrigation company and purchased American machinery for the project. About 500 acres of land will be irrigated at an annual cost of \$36 an acre.



The Machine at the Left was Incrusted with Ice by Only a Few Hours' Exposure to the "Silver Thaw," One of the Ice Storms Which Occur Here About Every Five Years

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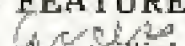


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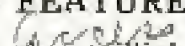
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"GASSING" BAD ODORS

BY HARRY A. MOUNT

Cresskill, N. J.

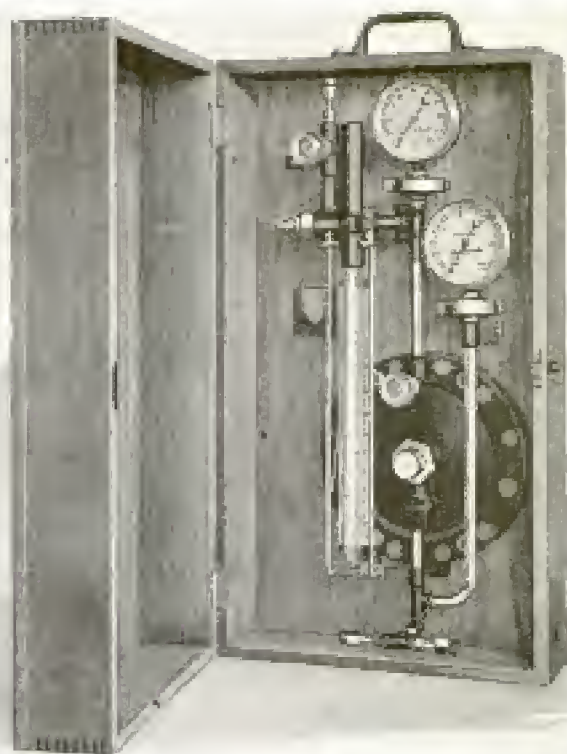
THE problem of getting rid of odors from garbage and sewage-disposal, fertilizer, and similar plants, which generally are a public nuisance unless located at isolated spots, has been somewhat simplified by the practical demonstration of the fact that minute quantities of chlorine gas will effectively kill the noxious odors, and by the construction of a compact apparatus for its application.

As tanks of chlorine gas, compressed to a liquid state, have largely replaced chloride of lime as a means of purifying water supplies, so these same tanks are utilized in "gassing" bad odors. The complete deodorizing plant consists of one or more tanks of liquid chlorine and apparatus for controlling automatically the flow of gas. This automatic control comprises a pressure compensator, which keeps the flow of liquid chlorine from the tanks constant in spite of varying pressure in the tank and temperature changes; pressure gauges to show tank pressure and back pressure in the gas line, and a meter to indicate the rate of flow.

The chlorine is allowed to vaporize into a gas in the control apparatus, and is then piped directly to a mixing chamber, where, by means of fans or otherwise, it is mixed with the odorous air. When the proportion of chlorine is cor-

rectly adjusted, the odor disappears at once and entirely.

Two severe tests have brought convin-



Portable Chlorinator, Showing Pressure Compensator, Pressure Gauges, and Meter for Measuring Chlorine Gas

tion that the process is practical. One of these took place at the Barren Island plant, where dead animals from New York City are cremated. The odors are carried off by means of a large stack. After it had been demonstrated that the odors from this stack, which are particularly offensive, could be completely overcome, a permanent installation of the sort described was made.

The second test was made in getting rid of sewer gas in Cleveland. The city is planning a large sewage-disposal plant on the lake front, near the heart of the city, and was faced with the problem of getting rid of the sewer gas in an inoffensive manner. It was finally decided to build an enormous stack, 200 ft. high, to carry the gas to a height where it would not be a nuisance.

The efficiency of the chlorine process was tested in this case by introducing the gas into the sewer about 175 ft. from the point of discharge. It was found that only a white haze was left at the mouth of the sewer and this was entirely without odor. As a result of this test, the plans for the new plant have been modified, and a stack only 50 ft. high will be provided.



A Chlorinator of the Type Commonly Used for Water Purification, but Modified for the Purpose of "Gassing" Bad Odors

7832P



Laying Concrete-Block Paving along the Miami River at Dayton: The Ends of the Half-Inch Cables, Which Hold the Blocks in Place, can be Seen Projecting from the Last Row. Though the Cables Keep the Blocks from Sliding into the River, They Allow the Entire Mattress to Settle and Adjust Itself

FLEXIBLE CONCRETE MATTRESS PROTECTS LEVEES

BY IVAN E. HOUK

*City Engineer's Office
Dayton, Ohio*

RECENT floods in the Great Miami River at Dayton, Ohio, have demonstrated beyond question the practicability of protecting levee slopes from erosion during periods of high water by flexible concrete-block paving. Owing to the comparatively crooked course of the river through the city, which throws the center

of the current from side to side, the velocity of the water is unusually high along the banks on the outer edges of the bends during even moderate freshets. To protect the earth and gravel slopes from erosion at such times, the engineers of the Miami Conservancy District constructed the flexible concrete paving



The Blocks are Anchored to Concrete Slabs Laid on the Bank just above them. The Tops of Piles, Driven at the Lower Ends of These Slabs, are Imbedded in Them When They are Poured, as are Also the Upper Ends of the Cables Which Run through the Blocks

shown in the accompanying views. The concrete blocks which form the flexible paving are 5 in. thick, 12 in. wide, and 24 in. long. They were laid flat on the river bed and bank, breaking joints like brick in a wall, and were tied together by $\frac{1}{2}$ -in. galvanized-steel cables, run at right angles to the levee through holes in the blocks, thus weaving them into a continuous flexible mattress. There are no connections whatever between the blocks except the steel cables. Consequently the entire mattress, or any part of it, can sink down whenever it is undermined by the current.

The mattress is anchored in place by tying the steel cables into reinforced-concrete slabs laid higher up on the bank. The slabs are 6 in. thick, 8 ft. wide, and of variable length, depending on the length of the slope to be protected. They have footings at their lower ends, extending 18 in. into the ground. The slabs are held in place by timber piles, driven deep into the bed of the river beneath the footings before the slabs are cast. The upper

ends of the slabs are left projecting above the ground, and the concrete to form the footings is poured around, so that the slabs are fastened rigidly to the piles.

During flood times the concrete slabs and blocks protect the river bed and



When Floods Scour Out the River Bed under the Edge of the Block Mattress, It Settles into the Depression. After One or Two Floods, the Mattress becomes Adjusted So That No Further Erosion and Settling Occur

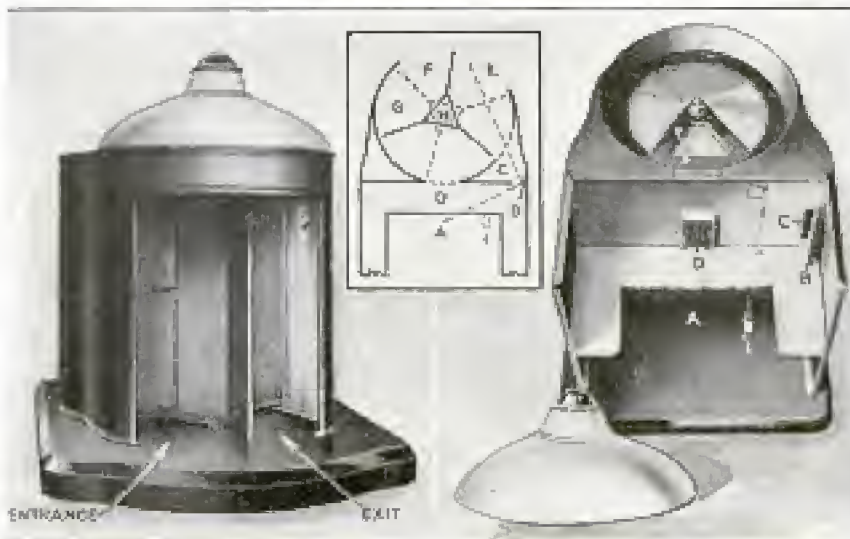
banks beneath them. At the river edge of the mattress, however, the swift current cuts away the earth and gravel, gradually undermining the concrete blocks. When this happens, the mattress simply settles down so as to cover the shore side of the hole, thus stopping the erosion.

BANDITS OUTWITTED BY SAFETY DOOR

Bandits have been outwitted by the use of a patented revolving door which op-

erates similarly to the ordinary revolving door seen in large buildings, except that its turning can be controlled with a pedal. If placed in front of a paying teller's, or cashier's window, it insures privacy to any

person receiving money, so that in the case of large withdrawals for pay-roll or other purposes, the amount cannot be seen by possible holdup men. By means of a properly placed mirror, the person entering the door can be seen by the cashier, before the window is reached. Thus if a suspicious-looking character enters the door with the apparent intent of holding up or shooting the custodian of the money, the simple release of the pedal would imprison the would-be thief until the arrival of the police.



Views and Diagram of Door: A Indicates Cashier's Place; B, Mirror; C, Window; D, Cashier's Window; E, Entrance; F, Exit; G, Space Where Bandit may be Locked In; H, Locking Device, and I, Control Pedal

el no. H. H. Brown, Duluth, Minn.
Cont. A. B. Thompson, 20 W. 2nd St. Duluth.

SIMPLE DIVING HELMET GIVES GOOD RESULTS

A diving helmet, which is not water-tight but gives good results in water not



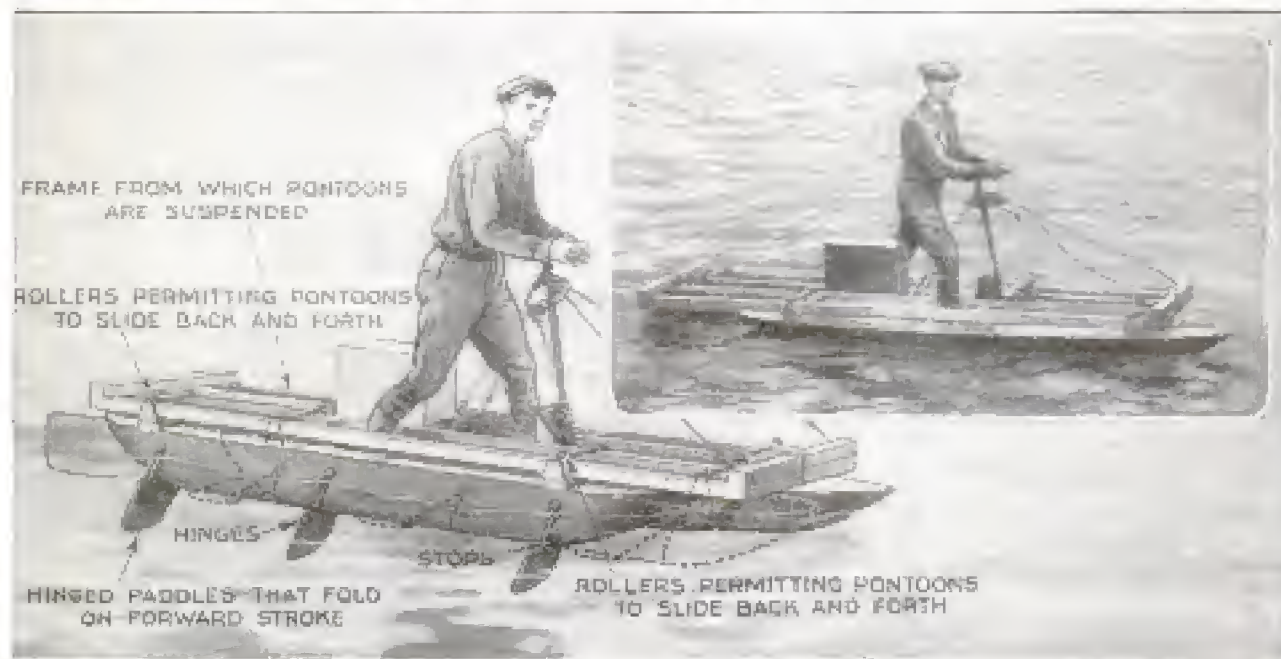
The Complete Diving Helmet and Air-Supply Pump Which Gives Satisfactory Results in Water of Any Depth Up to 20 Feet

more than 20 ft. deep, has been invented. It is made of cloth, fitting loosely over the head and shoulders and tied about the

neck. It requires only a moment to adjust it, and it is kept inflated by means of a hand pump. The air compression excludes water in the same way that the air in a glass, thrust into water, open end down, excludes the water. A glass window permits clear vision under water. The diver sinks by means of weights carried in his hands, which he can drop, in case of a failure of the air supply, and rise to the surface without assistance.

7451 SAN FRANCISCO BAY CROSSED ON WATER-WALKING MACHINE

Walking on water has been reduced from the miraculous to the practical before now—once, for instance, with a pair of pontoon shoes—but never quite in the manner done recently by a California rancher, who with his device has actually walked across the bay from San Francisco to Oakland. The water-walking machine is in the form of two light metal pontoons, each about 9 ft. long, and 12 in. wide at the center, tapering to points at either end. These are suspended from a flat wooden frame, so constructed that when the operator stands, with his feet connected to the center of the pontoons, rollers between the frame and the pontoons permit him to move them back and forth by the act of walking. Hinged to the sides of the pontoons, and operated beneath them, are three self-feathering paddles, which give propulsion. There is also a rudder for steering.



Machine for Walking on the Water Shown in Operation in the Inset, and in More Detail in the Enlarged View with Notations: The Propelling Paddles, Shown below the Hull, Are Self-Feathering. The Rudder at the Stern is Controlled by a Tiller in the Operator's Hands Which Also Affords Him Support, Enabling Him to Move His Legs Freely

cl no. A. N. Sheldon, Ventura, Calif.



Floating a Tug on the New Steel Drydock Recently Built and Put into Operation at Boston, Massachusetts:
This Dock Is the Only One of Its Kind in Boston and Probably the Smallest Floating Dock in the United States

SMALLEST FLOATING DRYDOCK OF STEEL IS LAUNCHED

A floating steel drydock, said to be the smallest in the United States, was recently completed and put into operation at Boston, Mass. There are no other drydocks of the same type in that city and only a few in the entire country. It is 100 ft. long, 45 ft. wide, and its pontoons are 6 ft. deep. The nine water-tight compartments can be emptied in 20 minutes by three centrifugal pumps. It has a lifting capacity of 500 tons and was especially built, by the company operating it, for handling small tugs and trawlers.

MONSTER EAR OF CORN THIRTY FEET HIGH

Among the exhibits at the International Grain and Hay Show, in Chicago, was a monster ear of corn, 30 ft. long. It was man-made, of course, but was such a close imitation that, at a little distance, there was nothing to distinguish it from a natural ear. Sixty bushels of corn were used to build it. The ears were split in half and attached to a central "cob." The

corn used to build this exhibit would have been sufficient to fatten five hogs from 100 lb. to 220 lb. each.



Monster Ear of Corn, 30 Feet High, Exhibited at the International Grain and Hay Show, Which was Recently Held in Chicago

Capt. A. H. Moulton
Room 2 Board of Trade, Chicago

Lynn, Mass.

"GOING-GOING-GONE" PHRASE IS OBSOLETE AT AUCTIONS

Auctioneering by electricity, which entirely eliminates the familiar loud-voiced methods formerly used, is carried on with

7520 ELECTRIC TRUING DEVICE AIDS MACHINISTS AND INSPECTORS

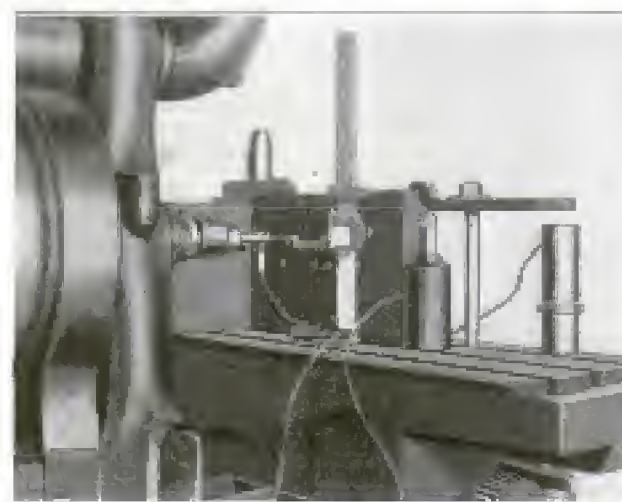
Machinists and inspectors can now true, or check up on, their work, very rapidly and efficiently by using an electrical locator recently brought out by a Lynn, Mass., concern. The instrument receives the current necessary for its operation from any light socket. It has a ball pointer, which can be placed in an ordinary chuck, and also a small steel lamp base holding an electric-light bulb. For operation, a plug and cord are attached to a light socket, one of the cord wires being connected to the ball pointer, while the other is connected to the lamp in the steel base. This base is placed on the bed of the machine, and the current



the aid of lately developed apparatus. A large dial, with a revolving indicator, is divided into numerals representing money, and has the designations of all the seats in the auction room appearing on it. This large dial is elevated in full view of those present, and at the bidders' seats are placed miniature duplicates of the large dial. When a bidder wishes to make an offer, he turns the indicator of the small instrument before him to the amount offered. By means of electrical connections, the indicator of the large dial swings to the same number, and the designation of the bidder's seat is illuminated on its face. Thus the auctioneer, and others present, can tell without confusion, how much has been bid and the location of the bidder.

NEW 22,000,000-GALLON WATER RESERVOIR FOR NEW YORK

The water supply of New York City will be supplemented by the new Gilboa reservoir, being built on the headwaters of the Schoharie River, in the Catskill Mountains. It will cover 1,170 acres, be 5.8 miles long, from 3 to 7 miles wide, 57 ft. deep, and have a capacity of 22,000,000 gal. The water to maintain this great reservoir supply will come from a 314-square-mile watershed on which the average annual rainfall since 1907 has been 40 inches.



In the Chuck at the Left is Shown the Ball Pointer Which Rests on the Work being Tested. The Indicating Lamp is Seen in the Center

TEACHING BAL- LOON CONTROL TO OBSERVERS

By FRANK B. HOWE

*472 Mason Opera House,
Los Angeles.*

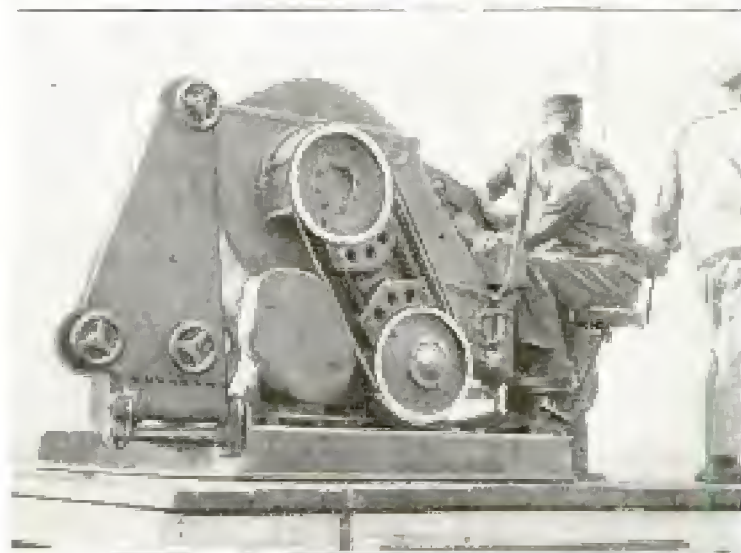
GREAT progress and many interesting developments are being made at the Naval Air Station, San Diego, Calif., in the training of balloon observers.

In the first place, a mechanism has been devised, somewhat on the order of the army trucks, which is equipped with balloon-handling apparatus. This enables the novices to practice balloon control without the usual attendant danger.

An old automobile engine was mounted on a stationary platform in the middle of the field and made to operate the drum carrying the cable that holds the kite balloon used in this work. Here the sailors who are learning to manage balloons can practice to their heart's content



The Balloon Pulled Down within 30 Feet of the Ground, While the Students Practice the Difficult Task of Climbing up and down the Rope Ladder



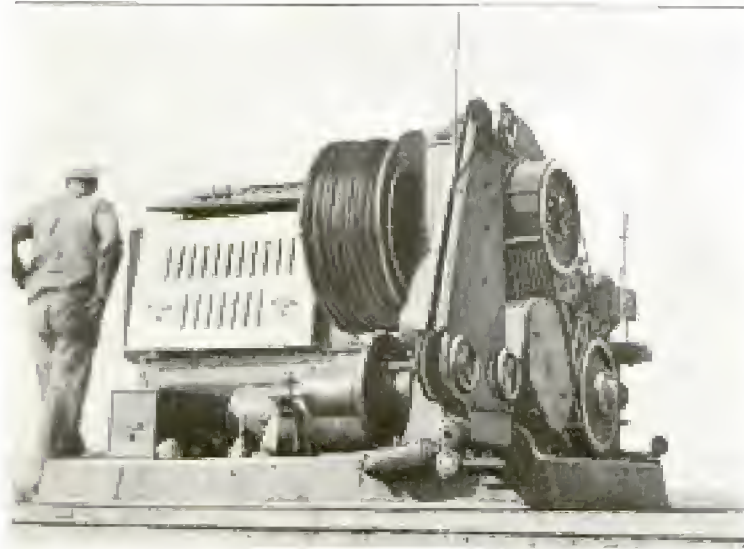
The Old Automobile Engine, Mounted upon a Platform for the Purpose of Operating the Winding Drum for the Cable That Holds the Balloon in Leash

without taking any chance of damaging the expensive balloon. The engine, which is kept running, is thrown in and out of gear with the drum at will, and two dials indicate the length of cable that has been let out. With this mechanism, they let the balloon out and haul it in until they are thoroughly

familiar with its handling.

To avoid having to pull the balloon clear to the ground each time some one wants to get in or out of the basket, a rope ladder, about 20 ft. long, is suspended below it. Hauling the balloon down with the auto engine until the rope ladder just comes within reach, the sailors practice running up and down the ladder until they become proficient enough to be able to do it under actual flying conditions.

Observation can also be studied under actual conditions by this method of rapid handling of the balloon. It is a simple matter to take up a number of the students, leave the big balloon at any given height, and let them



This Is Another View of the Automobile Engine and Cable-Drum Apparatus Which is Used in Controlling the Raising and Lowering of the Practice Balloon

Engineering News Record
Nov. 24, 1921

practice in making observations and determining distances, ranges, and weather conditions, all of which are of vital importance in warfare.

By the use of the stationary balloon-controlling apparatus, it is possible to give the students practical experience, instead of theory alone. As a result, they will be thoroughly familiar with the work, should they be called upon for duty in a future war.

CRANE ANCHORED IN WALL OF BUILDING

When a company in Dayton, Ohio, decided to erect a 13-story addition to their



The Crane, Extending above the Tall Building, is Anchored to Its Wall. The Anchor can be Seen About Three Stories below the Roof

present building, they discovered that there was no ground on which to set their hoisting crane. All the surrounding property was occupied, and, the site being

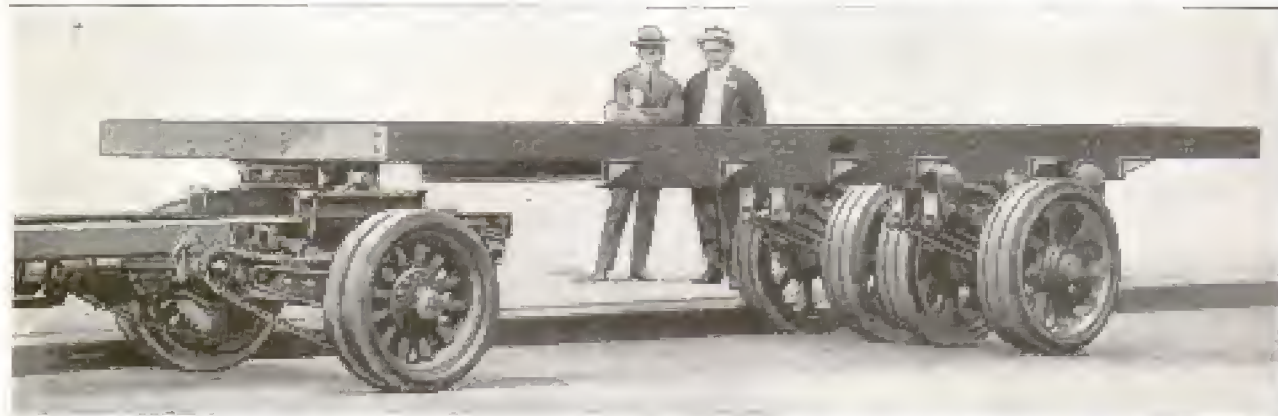
in the center of the city, use of the street was out of the question. However, the addition is going right up. The crane for hoisting the heavy steel girders and other material was anchored in the wall of the building to which the new structure is to be an addition.

POROUS-CONCRETE CASINGS USED AS WELL STRAINERS

Casings of porous concrete for well strainers are being used with satisfactory results in place of the usual brass strainer and steel casing. The porosity of the concrete is obtained by using a mix of one part cement to four of gravel, without sand, and with the gravel suitably screened. A casing of 36-in. internal diameter is made in 48-in. lengths, which are reinforced with $\frac{1}{4}$ -in. steel rings and $1\frac{1}{4}$ -in. vertical pipes. These are sunk by means of a steel casing with a cutting edge, which is removed when the concrete casing is in place. The concrete shell permits a flow of about 10 gal. of water a minute, and does not become choked with sand as readily as the ordinary brass strainer.

TRAILER FOR HEAVY LOADS HAS FOUR WHEELS ON ONE AXLE

A trailer with four wheels on one axle, for the transportation of extremely heavy loads, has been built for a large steel concern. Between each pair of wheels a separate set of springs is provided. In this way a bump on one side only is absorbed without bouncing the load to an extent which would injure either the load or the trailer. This trailer is attached to the truck on its own turning pivot, and a set of heavy coil springs takes up any shock from sudden starts or stops.



Exceptional Strains Caused by the Extremely Heavy Loads Carried on This Trailer are Met by the Novel Arrangement of the Wheels and Heavy Springs. The Rear Springs can be Seen Placed between the Two Sets of Wheels. Those Taking Up Starting and Stopping Strains Are in the Turntable

cmh Charles C. Reid 221 Salem Ave
Dayton, Ohio.

J. E. Herbst, 322 W. 12th St.
Dayton, Ohio.

7391 Emb. Ins. Ls. & Brady
American Embassy, Chacab 708
POPULAR MECHANICS

ARGENTINE INDIANS CROWDED OUT OF OLD HAUNTS



Mataco Indians. Members of a Warlike but Intelligent Tribe of the Argentine Chaco Family: Upper Left, Men, Who Have Two Languages; Below, Women, Who are Allowed to Learn Only One; Right, One of the Mataco Chiefs Who Act as "Labor Leaders" on the Plantations. One Chief Led His Indians Off to the Forest When Refused a Wage Increase

7391
As the great quebracho forests of northern Argentina are being cut away to satisfy the ever-increasing demands of the United States and Europe for quebracho tanning extract, the fierce tribes of natives that held out against Spanish rule for three centuries are losing their old hunting grounds, and are sullenly taking their places in the sugar and cotton fields of the white settler.

During the three centuries after the conquest of Peru, the Spanish missionaries penetrated all parts of South America, but were never able to gain headway among the wild tribes of what is known as the Gran Chaco of northern Argentina and western Paraguay. This vast country is flat and densely covered with forest, and many tribes still roam over it in primitive state. These tribes, belonging to what is known as the Chaco-Guaycuru family of Indians, were described by the early Spaniards as ferocious and irreconcilable, with an intense hatred of the white man. They were restless nomads who lived by hunting and fishing. Only within the last 20 years have they allowed the white man to advance his settlements, and then only because of fear of the Argentine army. They are now almost resigned to their fate, and they come to

the settlements in large numbers to work in the cotton fields or in the sugar mills.

One sugar plantation and mill employs over 2,000 of these Indians at present. They still keep to themselves and persist in their own customs. They live apart in "toldos," or reed huts, dye and tattoo their skins, and adhere to their ancient ceremonies. They have formed a great liking for the American moving pictures, however. At the plantation, owned by an English company, a moving-picture show is provided at the Indian village every Saturday night, and although they understand neither English nor Spanish, the Indians squat on the ground and follow the actors with many grunts in their guttural language. The American cowboy actors are their favorites.

2840
NEW PROCESS TO USE RUBBER AS PAPER-MAKING MATERIAL

Rubber will be used in paper making by a recently patented process, which is the result of many years' experiments. Rubber latex, or milk, as it comes from the tree, is mixed with the paper pulp. Many kinds of paper are benefited in this way. The proportion of rubber varies, up to 20 per cent, for different papers.

Inv. Fred Page
New Rubber age. 1/21
Copyrighted material

7717 Cmt. Arthur Hallam
 317 Cedar Ave. Minneapolis, Minn.
YARD HANDLES LUMBER WITH ELECTRIC MACHINERY



General View of the Minneapolis Lumber Yard Where Electrically Operated Machinery has Almost Entirely Done Away with Manual Handling of Lumber Previously Used: The Method in Operation Here was Worked Out as the Only Practical Means of Reducing Costs in the Lumber Business

IN a large lumber yard at Minneapolis, Minn., practically all the handling of lumber is done in large units by electrically operated machinery. Realizing that the cost of lumber production is thoroughly standardized, this company decided that the only point at which a saving could be effected was in the handling of the lumber in the retail yard. The method, based on large-scale machine handling and systematic routing, is the result of that decision, and it has proved highly successful in every detail of practical operation.

Incoming cars of lumber are made into trains each morning at the railroad yard, hauled to the company's plant and placed on sidetracks, alongside the building used to store the particular type of material which they contain. An electric overhead crane lifts the lumber from the cars in large "bites," and piles it in the storage sheds. In this way a car can be unloaded in 30 minutes, while formerly it took two men an entire day to unload a car by hand. This is typical of the efficiency with which every operation in the yard is now performed, in contrast with the old method.

When an order comes to the yard, it is turned over to the yard foreman. Under his direction it is picked up from the piles in large units by the electric cranes, which deposit it on trucks or trailers waiting at the ends of the storage sheds. The piles are so arranged in the sheds as to facilitate the rapid filling of orders, and only a few minutes are required for the loading of each truck. When it is necessary to deliver a load to another part of the yard, the crane places it upon a small trailer, or "lumber buggy." This is pulled by a small electric tractor to the point where it is needed. The whole process of transfer requires only a few minutes for completion.

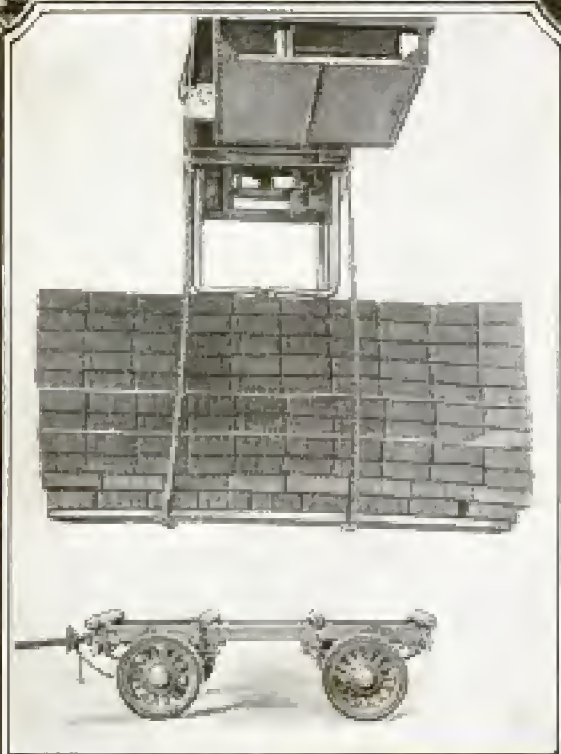
Heavy timbers, which are piled outdoors, are handled in the same way as other lumber. A special crane, on a track running the full length of the yard, is used for handling this type of material, and the timbers are piled in jagged piles so that they may be picked up easily, in units, by the crane.

The yard is planned in such a way that it is almost completely self-contained, and no outside help is required in any of its operations. A sawmill is so located that the cranes can carry lumber from the piles of stock to the saws. For orders needing special preparation, a planing mill is also provided which is supplied in the same way, by the cranes. In addition

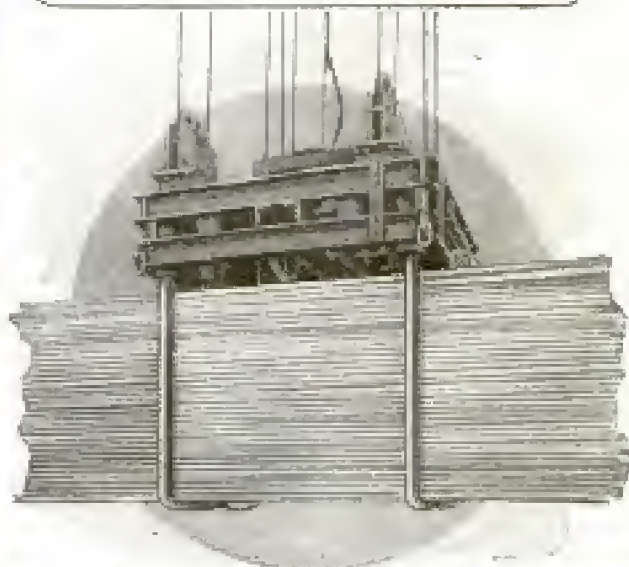
Thompson Yards, Inc.
Sawling & Harnish Hoses Milwaukee



Main Lumber-Storage Shed, Showing the Crane Which Picks Lumber from the Cars and Piles It Inside the Shed: The Crane Is About to Deposit One of Its "Bites"



Placing a Load of Shingles on a Truck Trailer for Delivery: A Whole Load is Picked Up from Stock and Loaded in This Way

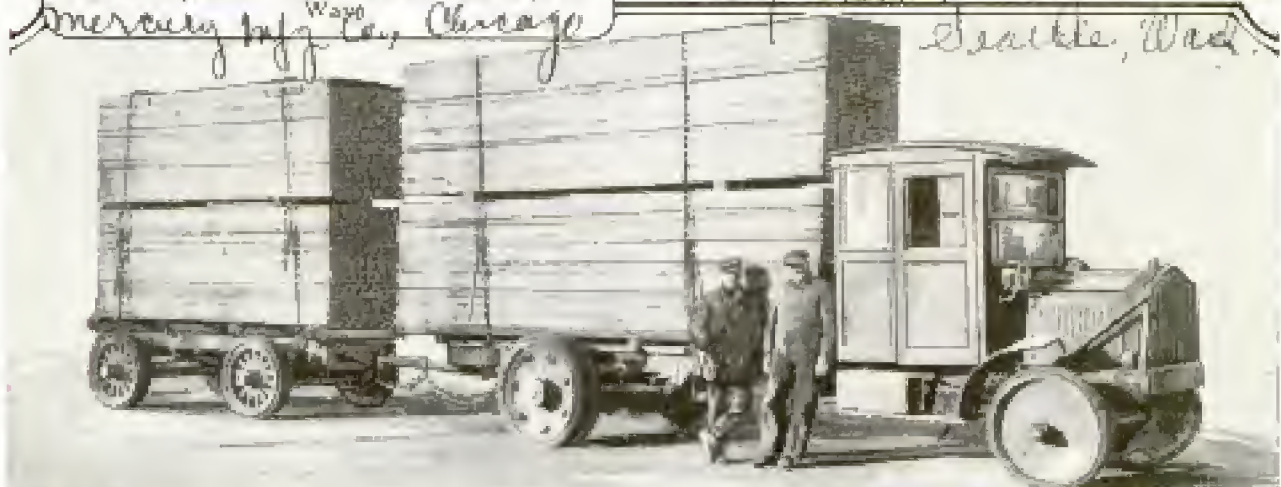


One of the "Bites" of Lumber Picked from the Flat Cars by the Electric Overhead Crane Which is Used for Unloading: This Method Effects a Great Saving in Labor and Time

Colby Street, Chicago

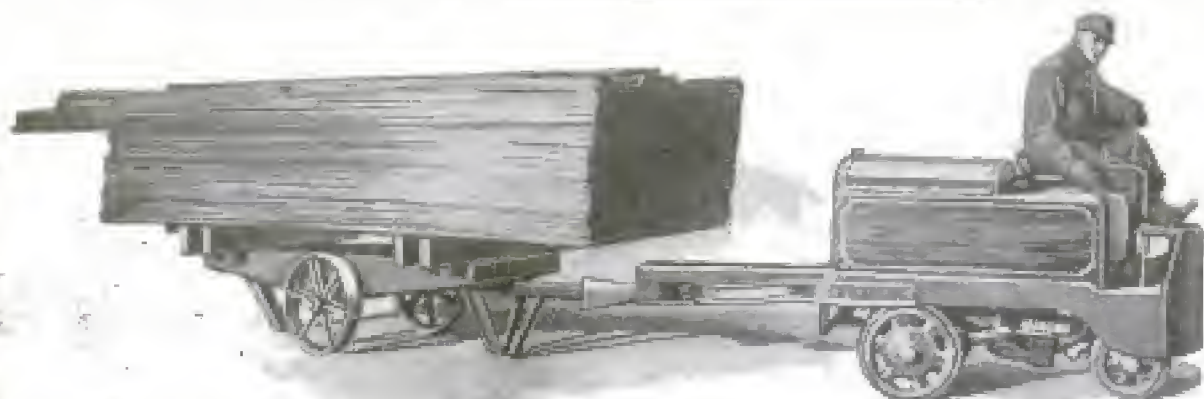
Mercury Lumber Co., Chicago

Seattle, Wash.



A Truck and Trailer Loaded by the Electric Crane and Ready for Delivery within a Few Minutes After the Order had been Turned Over to the Yard Foreman: Here Again the Saving in Time Greatly Reduces the Total Cost of Handling Lumber in This Yard

7717



One of the Small Trailers or "Lumber Buggies," Which are Used When It Is Necessary to Transfer Lumber from One Part of the Yard to Another: The Tractors Which Pull These Trailers are Electrically Operated

to these, the yard contains a horse barn and a garage where 24 trucks are housed. The garage includes a shop for repairing

gas, was necessary in maneuvering. The United States has the only known sources of helium in the world of sufficient magnitude to permit its use for balloon inflation; which would give this country a tremendous advantage in the air, in case of any future war. Helium is obtained from natural-gas wells.

2839 NEW PROCESS RECOVERS SILVER FROM FIXING BATHS

Fixing baths used in photography contain more or less of the silver emulsion with which the plate or film is treated to make it light-sensitive. While the amount of silver is too small for the amateur to recover profitably, those doing this class of work on a large scale, find it worth while to regain this necessity. A scientist has recommended a compound called sodium hydrosulphite, which precipitates metallic silver from the solution in the fixing bath. After the bath has been treated with sufficient of this compound, it is thereby revived, and can be used again. This compound has industrial application along several lines, considerable amounts being used in reducing indigo in the ordinary methods of dyeing with this color.

For the first time wireless-telephone messages have been sent from a balloon, at McCook Field, Dayton, Ohio. Though messages have been received by balloons, sending was considered impossible because of the danger of sparks igniting the gas. Lieut. Philip Schneebarger successfully kept in touch with the ground for 25 miles.



The Outside Crane. Used in Moving Heavier Lumber Which can be Stored Outdoors: The Crane Is Just About to Place Its Load upon the Delivery Truck

trucks and tools, for blacksmithing, building truck bodies, painting, and for charging the electric tractors which are used within the yard.

7876 FIRST FLIGHT WITH HELIUM-INFLATED NAVY DIRIGIBLE

The United States naval dirigible "C-7," the first balloon ever inflated with helium gas, made its trial flight, from Hampton Roads, Va., to Washington, D. C., and return, early in December. This test of the noninflammable gas proved satisfactory in every particular. The most notable features of the test were that there was no dispersion of gas through the balloon fabric, perfect inflation being maintained during the entire trip, and that no "valving" or release of

Ref. Times 12/5/21
P. 13

4886

Westinghouse Electric Co

Wide World

Photos

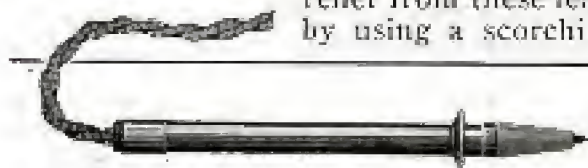
POPULAR MECHANICS
E. Pittsburgh Pa.
RADIO SERVICE BROADCAST
OVER ENTIRE COUNTRY

7715
WREATH INCASED IN ICE SENT
FROM ANTIPODES TO ENGLAND

Great success and widespread interest has been the outcome of pioneering in radio-telephone broadcasting, and a plan is contemplated whereby the entire United States will be covered with a service to the home, that will allow anyone to enjoy the many benefits of wireless. The service started with the transmission of the presidential election returns in November, 1920, and now includes the sending of musical recitals, grand opera, church services, speeches of prominent men, results of sporting events, government and stock-market reports, and national or international news of all kinds. Even "bedtime stories" have been sent out for children. It is predicted that this undertaking will prove to be of such expanding value to mankind, that the radio-telephone will soon be as popular in the home as the phonograph is today.

7653 FORGERY CAN BE PREVENTED BY USE OF SCORCHING PEN

Those who fear forgery, or the "raising" of their personal checks, may find relief from these fears by using a scorching



When the Cord of This Pen is Attached to an Electric-Light Socket the Point Becomes Hot Enough in 30 Seconds to Scorch Paper

pen when filling out checks. The pen is an electrical instrument, operating on the same principle as the familiar electric curling irons, and similar appliances, with cord attachment for sockets. A heating element inside the barrel of the pen, makes the point hot enough to scorch paper, leather, wood, cloth, and like materials. Thus, besides safeguarding checks by making letters and figures which cannot be removed, the pen can also be used for pyrographic work on wood or leather.

The anniversary of the battle of Trafalgar, known in England as Trafalgar Day, is always celebrated by the decora-



Among the Decorations Placed upon Nelson's Monument, in London, England, Last Year, in Celebration of the Anniversary of the Battle of Trafalgar, Was a Wreath Preserved in a Block of Ice Sent from New Zealand

tion with flowers and wreaths of the great monument in Trafalgar Square, London, which was erected in honor of Admiral Nelson, who commanded the British fleet at the notable victory. Last year a wreath was sent all the way from New Zealand preserved in the center of a block of ice weighing 600 lb. It reached the monument in good condition, and in time to take its place among the other decorations.

2861 SARDINIA ARTIFICIAL LAKES AMONG LARGEST IN WORLD

Sardinia, one of the island possessions of Italy, will soon have artificial lakes ranking among the largest in the world. These lakes are being constructed for irrigation and hydroelectric-power purposes. At the present time, the mining industry of this island forms more than a quarter of the entire Italian output. Zinc alone is produced in the amount of 200,000 tons yearly, but has to be transported to other countries for manufacture. With the hydroelectric power soon to be available, it is expected that, instead of the zinc being exported and then imported in the finished state, this and various other mining products can be manufactured at home.

Electrical Service 11/14/21

Post Electric Co
30 E 42nd St New York.

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7656 Cmt. W. K. Crosson
4429 Townsend Ave.
232 POPULAR MECHANICS
Electric Mach. 7841
NEW TYPE OF DOCK BUILT
FOR LOADING BARGES

Engineering
News Record
11/24/21
WINTER STREET-REPAIR WORK
DONE WITH OLD ASPHALT

A new idea in dock construction has been employed by the city of Detroit.



Detroit's New Barge Dock, with a 20-Foot Projection over the Water, Is a Great Aid to the Rapid Loading of Barges

Mich., to facilitate the loading of barges. Dirt, used in the reclamation project by which 200 acres are being added to Belle Isle, is dumped into the barges at this dock. It is built on heavily reinforced piling and the edge projects 20 ft. over the water. Because of this projection half the barge is under the dock, and motor trucks can dump their loads of dirt directly into the center of the barge. The city charges 30 cents a cubic yard for the dumping privilege, collecting revenue at the rate of \$100,000 a year, while securing dirt for its own work free.

CHEAPER LIQUIDS TO REPLACE MERCURY FOR THERMOMETERS

A discovery by Dr. Guido Moeller, a German scientist, may replace expensive mercury thermometers with a cheaper substitute, in places where accuracy within 1 or 2° is sufficient. Previous experiments in this field have failed because suitable liquids were colorless, and dyes did not darken them sufficiently, or would partly decompose at temperatures approaching 400° F. Doctor Moeller has found that three commercial chemicals—cumol, methylbenzoate, and amylbenzoate—can be relied upon for temperatures up to 300°, 400°, and 500° F., respectively. They can be dyed a dark brown with about one per cent of Syrian asphalt.

Old asphalt is employed for street repairs during the winter months by a method developed at Cincinnati, Ohio. It is broken to about 2½-in. size and heated, with 4 or 5 gal. of water, in 100-gal. tanks, about half full. After steaming for half an hour, the asphalt is turned over and allowed to steam again. This is repeated for three hours, when the water has evaporated, and the asphalt is ready for use at 325 to 375° F. It is hauled to the street in another kettle, over a hot fire, and is laid exactly like new asphalt except that it is tamped instead of rolled. No additional bitumen or dust filler is used, and the cost for repairing is

slightly less than it would be if the repairs were made with new material.

MOVIE-STAR ATHLETE DEFEATS HORSE IN FOOT RACE

George Walsh, the well-known athlete and moving-picture star, has achieved new distinction by outrunning a race horse.



The Finish of a Novel Race: George Walsh is Shown Here Beating a Race Horse at the Aqueduct Race Track, Long Island, New York

International Photo Service 326 Madison Chicago

Engineering 11/18/21

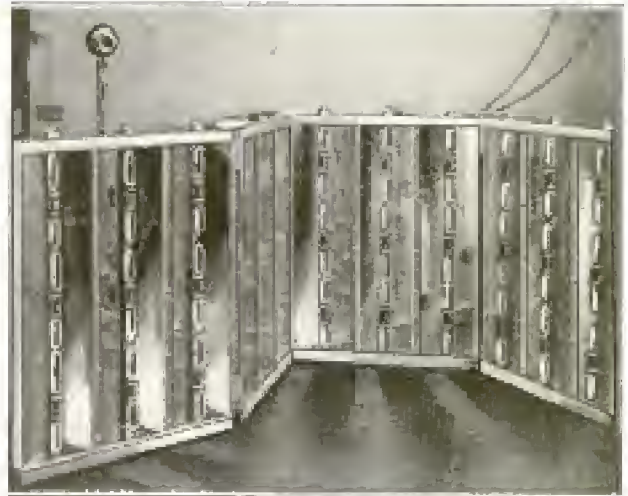
The race was the result of a wager made between Walsh and two jockeys, named Sande and Fator. It was held at the famous Aqueduct Race Track on Long Island, N. Y. Walsh's speed enabled him to beat the horse by a good lead.

7684

ROOFED-IN WATER RESERVOIR PROVIDES TENNIS COURTS

What was formerly an unsightly dumping ground at Arkansas City, Kan., has now been made to serve a double purpose—first, as a 2,000,000-gal. reinforced-concrete water reservoir, and second, as courts for playing tennis and volley ball. The new reservoir adjoins a small city park that is thus enlarged, offering more opportunities for play. The roof slab, 5 in. thick, was divided into 24-ft. squares, with expansion joints, which were also cast free from the supporting beams by the use of tar-paper joints. The man-hole openings and ventilators were so placed that ample space was provided for two tennis courts. Pipe couplings were installed in the roof slabs for the net posts, and sockets provided around the wall for posts so that the entire area could be fenced in. The reservoir is 156 ft. in inside diameter and 14 ft. deep below the overflow weir. The water in the reservoir will have the effect of keeping the concrete tennis courts cooler in hot weather than courts on solid ground.

Electric-light baths have proved to be of great value in the treatment of various diseases, and a folding cabinet that can



The Four Sections of the Folding Electric-Bath Cabinet: There Are 12 Rows of Lamps, with Reflectors in the Cabinet, and a Connection for Each Row is Mounted on the Top

be used at home, should be welcomed by those needing such attention. The new cabinet has four sections, so that it can be folded small enough to be placed out of the way behind a door or in a closet when not in use.



Above: Two-Million-Gallon Water Reservoir Before It was Roofed In, as Seen Below. The Roof, Made of Concrete Slabs, Accommodates Two Full-Size Tennis Courts, Which are Screened In to Prevent the Balls from Straying. Pipe Sockets are Provided in the Concrete for the Screens and Tennis-Net Posts

Cmt. George H. Paul }
900 Ellsworth Bldg } Chicago

**DRILLING AND STUD-SETTING
MACHINES FOR PROPELLERS**

**CONTEST DRAWS 10,000 IDEAS TO
INCREASE USE OF RUBBER**

With the use of two new machines, the time consumed in drilling and assembling a propeller is said to be reduced from 50 man-hours to as little as three. These machines are respectively a propeller-blade drill and a stud setter for the hub. The propeller blade is set, with its flange downward, on top of the drilling machine, where it is centered and held by three clamps. A handwheel, in connection with a horizontal spindle and a bevel gear, rotates the blade-carrying part of the machine, so that the flange is moved as required for drilling each hole correctly. Within the rectangular body of the machine, below this, is the drill, which is controlled by a crank handle on the outside vertical face. The drill is positioned with a handwheel beside this crank. Adjustments for drilling the blade flanges can be made with extreme accuracy. The other machine is motor-driven, and sets the studs in the propeller hub after the holes are drilled.

Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

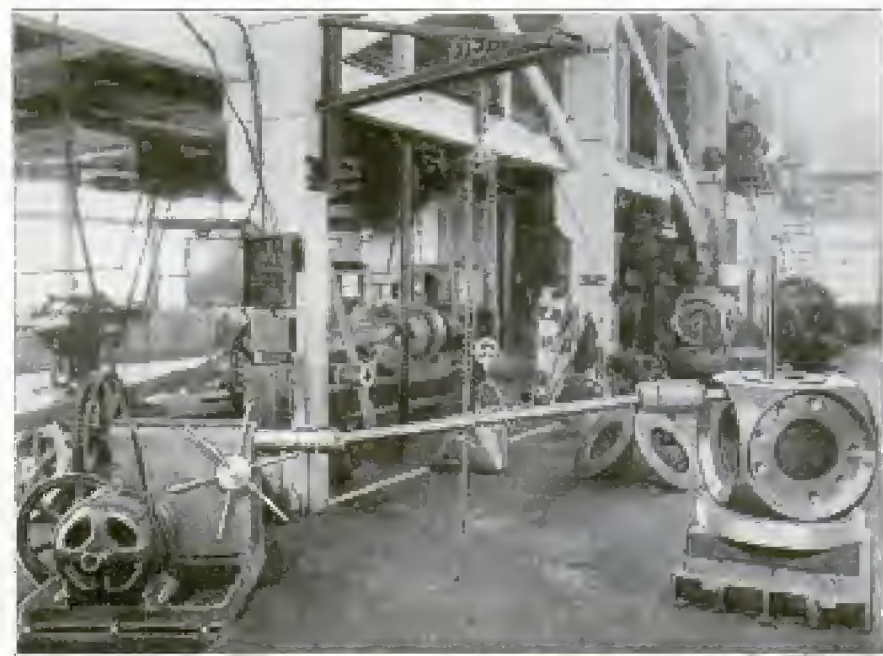


Propeller Blade with Its Flange Clamped to Top of Drilling Machine: Handwheel at Right Rotates Blade into Position for Drilling with Drill inside Machine

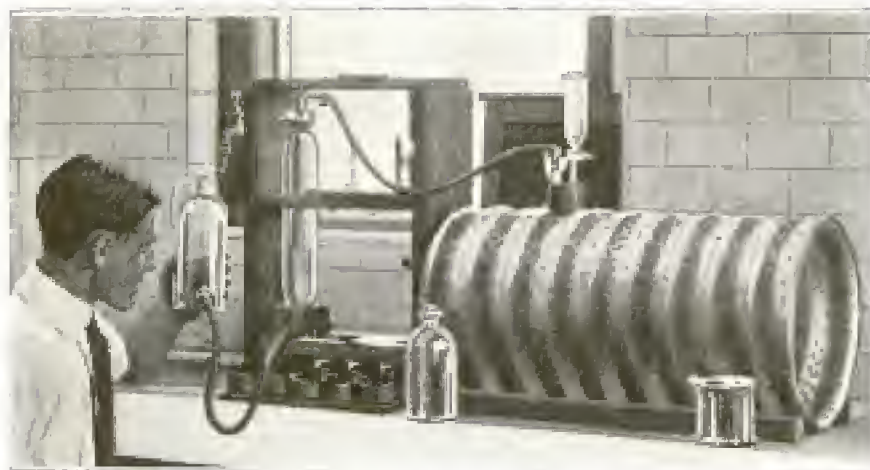
Results of a prize contest for ideas of new uses, or of extending present uses, of rubber, have just been announced.

About 10,000 suggestions were received, from more than 2,000 persons, by the Rubber Growers' Association, Inc., of Great Britain, which offered the prizes, totaling £5,000, or about \$25,000 at normal exchange.

Though the results were extremely disappointing to the judges, who state that hardly a suggestion was made which had not been anticipated by Goodyear in his book published in 1855, it is thought that the contest will give a great impetus to all the lines suggested. Prizes were awarded for suggestions for using rubber in sponge form for upholstery and mattresses; in liquid form with paint, for preserving wood and metal against the action of sea water, and to prevent the fouling of ships' bottoms; in paint for general decorative and preservative purposes; for automobile mudguards and curtains; with cement, for building purposes; for heat-retaining covers for hot-water cisterns; for the construction of sea buoys; for lining egg boxes and bottle-packing cases; in the con-



Motor-Driven Machine Setting a Stud in a Propeller Hub: The Holes for the Other Studs can be Seen Already Drilled and Tapped. The Driving Shaft is Flexible, and can Set Studs in Any Position



Determining the Weight of Galvanized Coating: The Acid-Resisting Ring Is in Place with the Tubing Connecting It to the Burette in the Cabinet. The Leveling Bottle is being Held at Measuring Level. At the Right, the Apparatus is Shown in Its Cabinet



struction of ship and wharf fenders; for washstand tops; under carpets in place of paper or felt; for fixing window glass in the place of putty; for cistern-chain handles; for clothes pegs or hooks; as fillets for patternmakers; in caps, for the ends of ladders to prevent slipping; for bouncers attached to footwear; in equipment for the arctic regions; as linings to preserve bleaching vats; in bellows, particularly for foundry purposes; as slip-on jar and bottle covers; in crêpe form for rough-surfacing cement; as covers for door handles; for phonograph-table tops; for kneecaps for coal-mine workers; in the composition of certain lubricants, and for water deflectors to be used on the handles of mops and brooms.

TESTING DEVICE WEIGHS GALVANIZED COATINGS

The galvanized coating on sheet metal or wire is usually specified to be of a required weight per square foot. There has been developed an instrument for determining the weight of galvanized coating on a known area by test, either in the laboratory or in the field. The operation of the instrument is based upon the action of hydrochloric acid on the galvanized coating, the hydrogen gas produced being collected and measured. A flat acid-resisting ring of known area, sealed with acid-resisting wax to the object to be tested, has inserted into it a filling tube provided with a glass stopcock, and beside this two exit tubes, which are connected by a rubber tube to a graduated glass tube, or burette, filled with water. Another rubber tube from the bottom of the burette connects it to a leveling bottle. By treating the ring successively with

small amounts of hydrochloric acid and antimony-chloride solution, when the leveling bottle is held so that the water in it and in the burette are brought to the same level, the volume of hydrogen in the burette can be measured, and by this means, in proportion to the known area of the ring, the weight of the coating per square foot can be calculated with sufficient accuracy.

TOUCH-TYPEWRITING STUDENTS AIDED BY KEYBOARD SHIELD

To aid students in learning touch typewriting, a combined keyboard shield and divider can be attached to the regular typewriter. The shield covers the keyboard in such a way that it does not interfere with operation, but prevents the student from watching the keys and drifting into the sight habit. It also serves as a convenient support for a notebook. The divider separates the keys operated with the left hand from those operated with



Keyboard Shield and Divider, Attached to a Typewriter, at the Left; The Shield may be Used to Support a Notebook, as Shown at the Right

the right, and keeps the hands from wandering over onto the wrong part of the keyboard.

Chas. Allen P. Child
Box 73, Station E, Kansas City, Mo.

7673

PRESENT SIXTY-POUND FRUIT CAKES TO FAMOUS PERSONS

Several hundred 60-lb. fruit cakes were placed on display in Seattle, Wash., not long ago. These cakes were made and



This 60-Pound Fruit Cake, Specially Made for Pope Benedict XIV, Was One of Several Hundred Presented to Famous Men and Women

sold by a local cake bakery, to be presented to famous men and women in all parts of the world. Some of the persons for whom cakes were made were President and Mrs. Harding, the president of

France, the king and queen of England, the king and queen of Belgium, the president of China, the king of Italy, the king of Sweden, Mary Garden, Pope Benedict XIV, Thomas A. Edison, Henry Ford, and Chief Justice Taft. Each cake was decorated with appropriate designs and flags.

7860

Radio of President

FOG SIGNALS CONTROLLED BY USE OF WIRELESS

Controlling fog signals by the aid of wireless is a development that will be appreciated by seafarers, as they have been urging protection of this kind for some time. A wireless transmitter, suitably located on shore, sends out a series of "dots," which are received upon a small aerial on the fog-signaling apparatus. These dot impulses in turn operate a relay, which controls the valve of the gas, or compressed-air tank, and thus sounds the fog signal. It is said that the system has proved entirely satisfactory wherever tried, and also that it has continued in operation even under the most adverse weather conditions. Apparatus of this description is now being used to protect the shipping along the Clyde, in Scotland.

7742

Electrical Review 11/4/21

AIRPLANE AND AUTOMOBILE TIE IN TUG OF WAR



given signal both drivers started their motors. The two machines seesawed back and forth across the field, amusing the spectators, but neither gaining a permanent advantage. After this had gone on for some time, the judges were finally forced to declare the contest a tie.

A Novel Tug of War, between an Airplane and an Automobile, Which Resulted in a Tie

At a recent California air meet, one of the feature events, a tug of war between an automobile and an airplane, attracted much attention. The ends of a strong rope were attached to the rear of the car and the fuselage of the plane. At a



These Two Machines, Pulling Each Other Back and Forth across the Field, Furnished Much Entertainment for the Spectators at a California Air Meet

Have think it was a Curtiss 4-6, funny?

A rank B. Home 4:3 Mason Opera House Bldg. Los Angeles Calif.

Upper Right: The Exterior of the Soviet Government's Propaganda Train Which Travels over the Country Distributing Radical Literature. Below: The Interior of the Train, Showing How It is Fitted Up as a Library



The exterior of the cars are highly decorated with suggestive cartoons in which older forms of society are represented as monsters, which the Soviets successfully conquer. The interiors are fitted up as libraries, where Soviet propaganda literature, consisting of books, pamphlets, and newspapers, is given free

to all those who apply. It is said that the peasants look forward with eagerness to the arrival of these trains.

MIGRATING SEALS TRAVEL IN MILITARY FORMATION

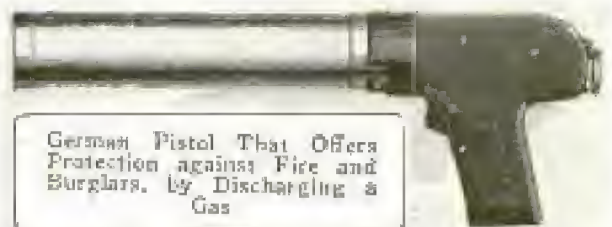
Little is known of the habits of Alaska fur seals after they have left their breeding grounds on the Pribilof Islands, but a report from John Kunder, former keeper of the Farallon Light Station, on an island west of San Francisco, adds some interesting information. In March, 1920, Kunder saw a herd of about 10,000 seals approach the island from the south. They advanced in a line about two or three miles long, stopped for a moment and then swung around in perfect military formation and advanced rapidly in a west-northwest direction. Three years before, Kunder saw a similar performance by a herd of about 15,000 seals. These are, as far as known, the only times that seals have been seen in large herds in the open sea, where they usually appear either singly or in scattered groups.

READING MATTER DISTRIBUTED BY RUSSIAN GOVERNMENT

As a means of distributing its radical literature, the Russian Soviet government uses railway trains which travel through the country continuously, and from which are given radical lectures,

FIRE-EXTINGUISHING PISTOL ALSO REPELS BURGLARS

Poison gas in some form or other is apparently being applied in Germany to domestic uses, judging from an advertisement in a Berlin paper. A picture of a pistol, that looks very much like an automatic with an enlarged barrel, is described as being for protection against fire and burglars. The means of protection is not mentioned, but presumably it is something on the order of the ordinary chemical extinguisher, and is operated by pulling a trigger instead of turning it up-



German Pistol That Offers Protection against Fire and Burglars, by Discharging a Gas

side down. The gas that is then discharged is apparently equally effective against attack by fire or burglars.

B. Zaichenfleck
Berlin 10.30 Halberlandstr.

Science 12/2/21

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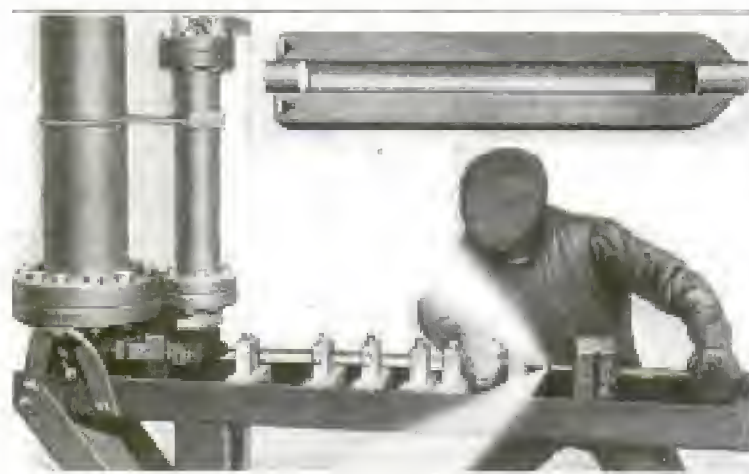
74 74

manufacture
"SAND-BLAST" PROCESS USED
IN MAKING HOLLOW STEEL

A patented process for making hollow steel, such as used in mining drills, is applied by an American company. This

steel must be very hard in order to enable the drills to cut through stone. In the new process a thin steel tube is thoroughly cleaned, then filled with sand, and inserted in an ingot mold, where hot metal is poured around it.

After the ingot is cast, the sand remains in the tube to maintain its shape while the ingot is rolled. Following the rolling process, the sand filler is removed by a sand blast. This apparatus has a compressed-air tank, a sand reservoir, and a small tube connected to both. When the air is released from the tank, it passes a hole at the bottom of the sand reservoir, and sucks a certain amount of sand therefrom. This jet of mixed air and sand possesses great cutting power, and it is stated that a round hollow steel bar, 20 ft. long and $1\frac{1}{4}$ in. in diameter, can be cleaned in one minute.



Air and Sand Tanks, at the Left, and Small Tube Carrying the Sand-Blast Mixture: The Workman is Cleaning Out a Piece of Hollow Drill Steel. Insert: Cross Section of Drill-Steel Ingot

7803
ATTRACTIVE ENTRANCE GREETES
FLOWER-SHOW VISITORS

Perhaps the most attractive feature of the California Flower Show, held at Los Angeles, was the entrance. A huge basket was built directly in its center, and a small room in the lower part served as a ticket office. The upper part was completely filled with shrubbery, palms, and

7887
REMARKABLE WATCH CARRIES
MANY COMPLICATED DIALS

One of the most complicated watches ever made has been produced by a company in London, Eng., for an American customer. The intricate mechanism is inclosed in a case 3 in. in diameter and about $1\frac{1}{2}$ in. thick. Dials in the front carry the usual hour and minute hands; a hand showing the difference between mean and true sun time; a fly-back second hand moving in fifths of seconds, the indications of which are added on a dial at the side of the face, up to 12 hours; a record of the phases of the moon; the day of the week and month. A dial on the back is graduated to 24 hours, two sets of 12 hours each, for forenoon and afternoon time. Its hour and minute hands show sidereal or astronomical time. The watch strikes the hours, quarters, and minutes, repeating them at any desired time.

As a result of traffic policemen giving the right of way to private automobiles, mistaking them for fire trucks, the Chicago city council has passed an ordinance, effective January 1, prohibiting the use of the same shade of red for private automobiles as that used by the fire department.



Novelty and Beauty are Strikingly Combined in This Entrance to the California Flower Show

giant artificial poppies, the state flower of California. In the center of each poppy was mounted an electric bulb, and, at night, the effect was most pleasing.

Keystone View Co. 91-9th Avenue New York

London Times Weekly 11/18/21

HAND-POWER STUMP PULLER RAISES SUNKEN ENGINE

AN impromptu demonstration, as sensational as it was successful, was made recently in the Pacific Northwest of a newly invented one-man stump puller of original design.

A donkey engine, weighing nearly 10 tons, was being taken across a swamp under its own power, when, just as what appeared to be a patch of solid ground in the middle of the bog was reached, one of the sled runners broke through, and before skids could be brought into use, the donkey capsized. In a few minutes the engine had settled until only the steam pipes and cylinder on one side could be seen above the surface.

The inventor of the new stump puller happened to be in the vicinity showing his device at work on logged-off land. He rushed to the scene and fastened his tackle to the fast-disappearing donkey engine. The puller weighs, with



The 10-Ton Donkey Engine Capsized in a Swamp: Except for a Cylinder and the Steam Pipes, the Engine was Entirely Submerged in Muck

complete equipment, only 135 lb., as compared with the 20,000-lb. weight of the donkey engine. But in one hour 15

minutes it had pulled the donkey upright. The boiler was then guyed to a near-by tree with a line, but before steam could be gotten up, the engine had settled again so that the firebox was submerged. Thereupon the pulling device was placed

ahead of the donkey, the tackle reset, and before nightfall the engine was extricated from the bog.

The new stump puller consists of eight simple parts, only three of them moving. Without hook and cable, it weighs less than 100 lb. It is operated under normal conditions by one man with a 12-ft. sweep, which gives a straight-line pull of more than 20,000 lb. Equipped with one block, it pulls 20 tons, and with a luff, more than 150 tons, it is claimed. A drum protects the heavy steel



This Is the Hand-Power Stump Puller with Which the Donkey Engine was Hauled Out of the Swamp. The Lever Shown on the Mechanism Is 12 Feet Long



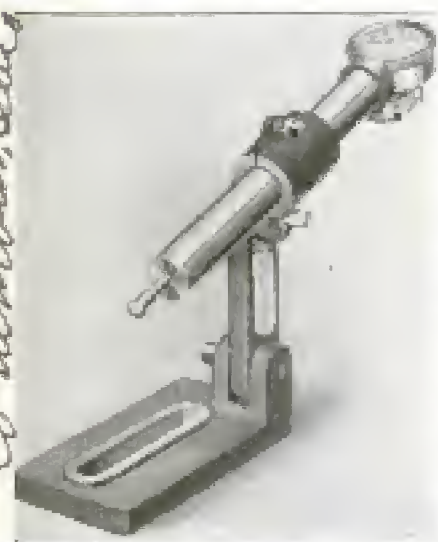
The Raising of the Donkey Engine by Means of the Stump Puller and a Rope Fastened around the Top of the Sunken Machinery: In This Manner the Engine was Dragged to Dry Land

cable used on the machine from cutting and grinding, and an internal safety dog holds the load at any time. There is a ratchet on the sweep, so the operator need not endanger himself by stepping over the cables.

SHAPE IRREGULARITIES SHOWN BY DIAL RECORDER

Emery wheels on grinding machines, compound rests on lathes, and similar attachments often become loose, and the

result is that pieces in the process of working get slightly out of round. An indicator built of three pieces—a base, a vertical arm, and a cylindrical impulse recorder—constitutes



a device for discovering such trouble. The recorder is held up to the piece of

spinning stock by the vertical arm which can be set at any angle desired by loosening the joint bolts, adjusting the recorder to the position necessary and tightening the bolts again. The contact with the spinning stock to the cylindrical recorder is established by a little ball on the recorder's end. This ball rubs on the stock and, as it is moved up and down by the undulations of the piece being worked, transmits the varying impulses to a gauge which records in thousandths of an inch how far the piece is out of shape.

GERMS IN MILK ARE COUNTED BY ECONOMICAL PROCESS

Germes in milk can be counted quickly by means of a new testing cabinet designed at the University of Wisconsin, and which is being used with success by dairymen of the middle West. Instead of costly laboratory equipment, the tester consists of a field outfit in a small metal case, weighing but 20 lb. when fully equipped, and with which 96 samples can be analyzed on a single trip. The case is heat-insulated so that the contents may be kept at the proper temperature at all times. In making a test, a measured drop of milk, and a drop of germ food, called agar, are spread together on a glass slide, or plate, over an area of about .16 sq. in., with a sterilized needle. The plate is then

placed on one of the many shelves in the cabinet, or incubator as it is termed, and allowed to "grow" for a period of eight hours. At the end of this time, the plate is removed and the germs dried upon the glass, after which they are colored with a stain, so that they can be easily counted by the aid of a microscope. Thus the number of germs in any given quantity of milk can be determined. The method is said to be so simple of operation that a man can be taught to do this work in one week. This new field outfit reduces the amount of glassware ordinarily used, to an amazing minimum.



Above: Placing a Drop of Milk, Together with Germ Food, on a Glass Plate. The Small Case with Numerous Shelves for Holding the Plates is Seen in the Background. Below: Amount of Glassware Required by Old Method at Right, and at the Left, the Few Pieces Needed with the New Cabinet



Wm. Russell E. A. 1010 Israel St. Madison, Wis.

Atcham Tool & Lbr Co. 609 My South St. Columbus, Ohio



Illustrating the Manner of Unloading a Carload of Coal Screenings with the Aid of Water Which is Pumped from the Pond and Directed into the Cars at Either End: The Screenings are Washed down the chute into the Pond, Where They Are Safe from the Danger of Spontaneous Combustion

7490

OLD CLAY PIT USED TO STORE COAL SCREENINGS

Good use is being made of an old clay pit at Springfield, Ill. Coal screenings are stored here throughout the dull seasons. The pond, which covers two acres and in parts is over 50 ft. deep, will hold about 75,000 tons. It was formerly used for the storage of zinc screenings, and consequently the pipes were already in place for the handling of coal. An electric pump has been installed. With this, water is pumped from the pond through two pipes that reach either end of the car, thus washing the coal into the pond. The company estimates that coal can be unloaded in this manner at a cost of three cents a ton, and that by reversing the operation the coal can be reclaimed at a cost of 10 cents a ton. This storage method prevents spontaneous combustion, which is ordinarily an almost constant menace. It also gives the company washed screenings to market when there is the right demand.

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ARTIFICIAL ARM OVERCOMES CRIPPLE'S HANDICAP

7729

During the medical exhibition in Central Hall, Westminster, London, Eng., a demonstration was given which showed the great possibilities of a new artificial arm. This appliance makes it possible for a person who has lost one arm to do almost anything which he was able to do before his loss. The principal feature of the demonstration was the playing of a violin. A one-armed man was able not only to play, but to play quite well.



A Demonstration of a New Artificial Arm at Reception Medical Exhibition at Central Hall, London: The Man Was Able to Play Quite Well

Ulrich Papyfiling

242

Equipment

POPULAR MECHANICS

NEW DESK TRAY BOTH WIND-

7714 PROOF AND CONVENIENT

A new desk tray holds papers in a vertical filing position and prevents their being blown away by drafts from electric



When Compressed, the Springs, Extending the Guides, Lie Flat, Taking Up No More Room Than the Ordinary Compressor Blocks

fans or open windows. It consists of a base with endpieces and fixed guides at regular intervals. Between the fixed guides are compression guides made of two pieces of cardboard hinged at the upper edge. Spiral springs between the two parts keep them spread and hold the papers in place.

7771 MOTOR-TRUCK TRANSPORTS TRAIN IN NOVEL MANNER

It became necessary to transport a train of "batch boxes," used in the construction of a cement road forming a part of the Pennsylvania highways, and this was done in a novel manner by the use of a large motor truck. A section of railroad track was inclined to the level of the deck

of the motor truck, on which rails were mounted. The train was then backed up this incline until three of the batch-box trucks were on top of the motor truck. These were then taken to their destination, where they were unloaded down a similar incline. The operation was repeated until the whole train, as well as the locomotive, were transported.

7858

BATTERY VOLTAGE REVERSES AT LOW TEMPERATURES

Recent tests to determine the reliability of batteries at low temperatures, resulted in the startling discovery, that a reversal of their polarity occurred at 170° F. below zero. The experiments were conducted by the Bureau of Standards, and, so far as known, the phenomenon has never been observed before. It was stated, however, that the reverse currents were so small that there was no probability of their being used to recharge the battery.

Electrical World 12/3/14

BOOSTERS' MEETINGS CALLED TO ORDER BY HORN

The gavel, or hammer, the symbol of the knocker, has disappeared at the meetings of the "100 per Cent Club" of San Francisco, and has been replaced by the horn, the symbol of the hooster. Since the club is an organization of boosters, D. R. Pinney, the president, decided that it would be most appropriate to call the meetings to order with a horn.



Train of "Batch Boxes," Used in Building This Cement Road, being Loaded, Three at a Time, on the Large Motor Truck at the End of the Inclined Track: These Batch Boxes are Then Transported, and Unloaded in a Similar Manner, Whereupon the Motor Truck Returns and Repeats the Operation

Charles L. Reid, 221 Salem Ave.
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Clayton, C.

Leul Agency. Karel + Herbert. Mr Aol
maurice Pelgrins 35 Place de la Gare
Antwerp Belgium.

Speed and Comfort on the Hydroglider

By Henry S. White



കേരള സർവ്വകലാശാല, തൃശ്ശൂർ, 686 001

An Example of the Modern Hydroglider, without Cabin Accommodation, Built for Any Form of Rough River Work: The View Shows the Stern with the Aerial Propeller Revolving at High Speed

IN land transportation, within the last 20 years, there has occurred a transformation from the horse and buggy to the high-speed automobile. In the navigation of rivers and lakes a similar development is now taking place. The ancient paddle wheeler is being supplanted by the modern hydroglider. The development has been gradual. It began, as in

the case of the land vehicles, with the introduction of the internal-combustion engine. This led to the first design of the hydroplane, or craft that skims on the surface rather than plows through the depth of the water. In this connection there have been many modifications of hull design. Until recently they were driven by immersed or semi-immersed propellers, which, besides lacking in efficiency, were likely to hit any obstruction, or to get fouled by reeds or other weeds, which are common in shallow waters. Finally came the type now under

development, which skims on the surface of the water, and is driven by an aerial propeller. These are known as water or hydrogliders. The pioneering work in this type was done by a French aerial engineer, who during the war developed a glider that proved to be of great service in the Mesopotamian river campaign. The most recent developments are exemplified



The "Yarrow," a Hydrogilder Built on the Clyde, in Scotland, Which Attained a Speed of 50 Miles an Hour When Operating as a Passenger Boat, Not as a Racer, as Its Speed might Well Suggest.

Europe - Harman & Co, 167 Rue de Silly,
Paris, France, Billancourt, Seine

American Builders The Sea
Shed Co., West Nyack, Conn.

W. J. Oberlin, Otago, O. Hybridized. 1890. P.

December 1922 - 837
January 1923 - 904
Feb. 1923 - 583



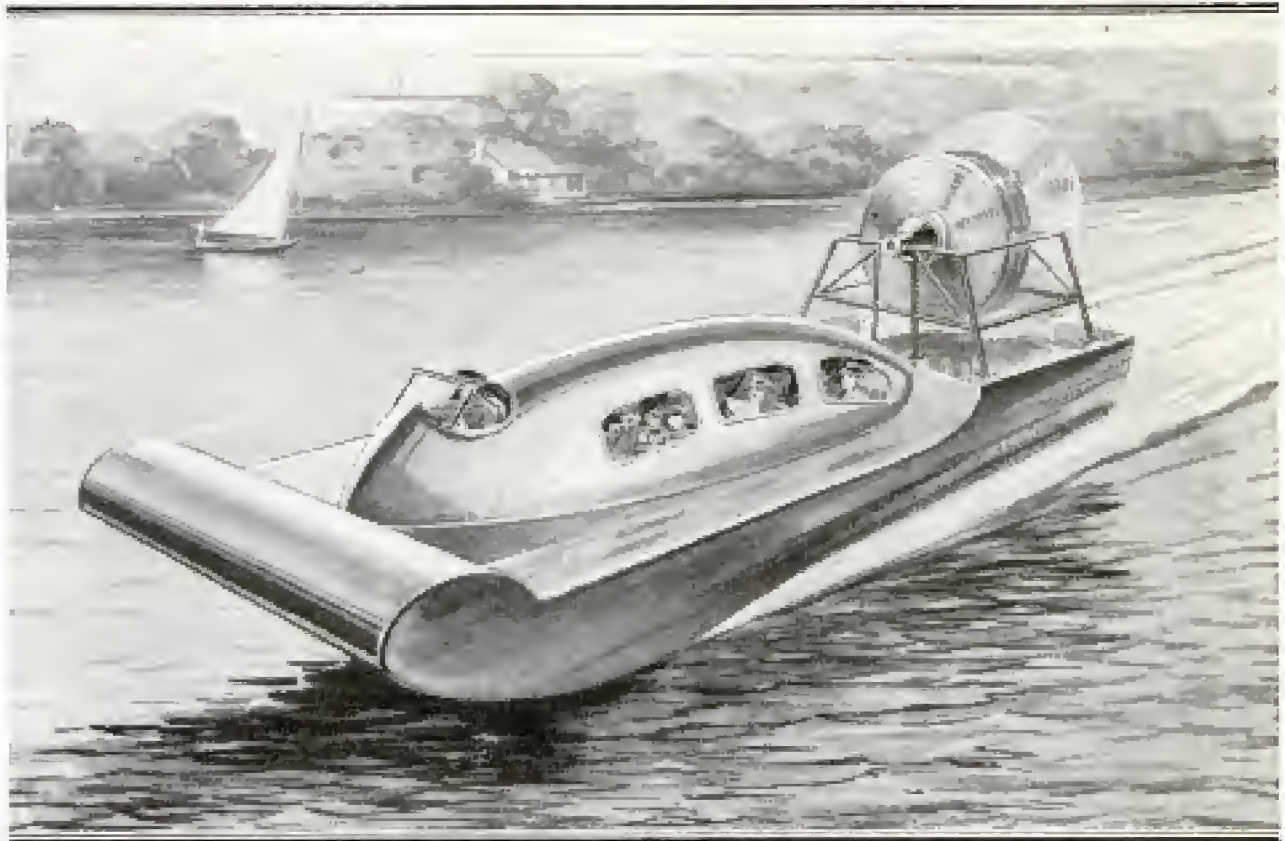
French Hydroglider with Turned-Up Prow to Facilitate Gliding: Its Cabin Accommodation Closely Follows Automobile Lines, and Its General Appearance might Reasonably Suggest That It Is a Water Taxi

in a glider built on the Clyde, in Scotland, called the "Yarrow," which has attained a speed of 50 miles an hour. In this type all models are characterized by a rectangular hull built up of five or more separate caissons, and between the caissons a narrow space of varying form according to its position in the hull, and to the size

and horsepower of the boat. This construction gives great elasticity, and is in every way superior to the older type, known as the "stepped" hull, especially for high speeds. These newer hulls are uncapsizable, and are easily made unsinkable. The propeller is of the aviation type, and is driven with silent chains by a water-cooled internal-combustion engine. When at rest, or moving slowly, these gliders draw 8 or 9 in. of water, but as the speed increases they climb out of the water until, at 50 miles an hour, the hull merely skims the surface, suffering comparatively little resistance—that of the air instead of the water. The gliders



Latest Development of the Hydroglider by the French Engineer Who Was the Pioneer of This Type of Craft: This Model Follows Automobile Lines, and Has a Limousinelike Body. The Inset Shows Its Pullmanlike Seating and Sleeping Accommodations



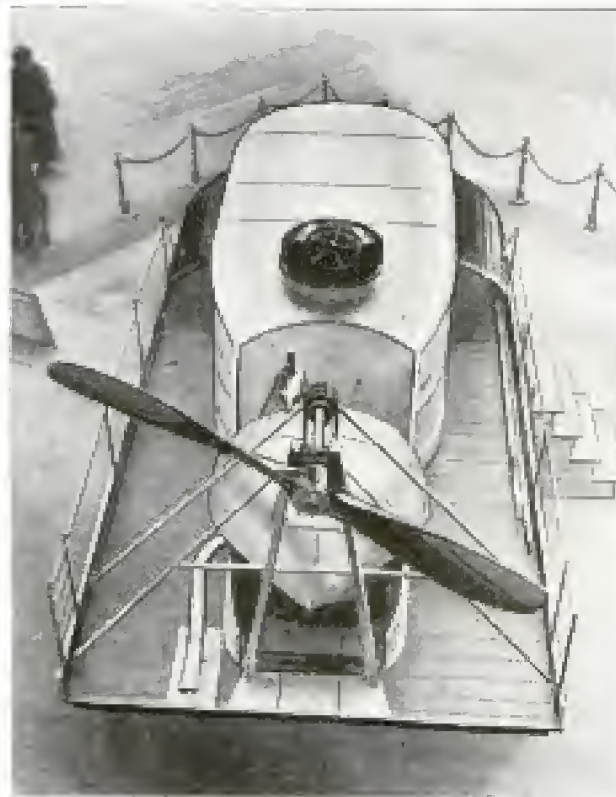
Modification of the Hydroglider as Designed by a Belgian Lady: Its Special Novelty Is in the Curved Shape of Its Hull Bottom. It Has Exceptionally Luxurious Cabin Accommodations. The Motor at the Stern Is of the Rotating Air-Cooled Type, Formerly Used on Airplanes

are controlled and steered by an ordinary automobile wheel.

Fundamentally, all of these hydrogliders are similar. They vary in size and power, and also quite considerably in cabin design and accommodations. One, called the "Farum," that is used on the river Seine, in France, as a sight-seeing boat, is said to have attained a speed of 56 miles an hour. Another, the special design of the French aerial engineer referred to above, has a cabin much on the lines of an enlarged limousine, with Pullmanlike seats that can be converted into sleeping berths. Another of this type has a wide curled-up prow that facilitates gliding. One, still more recent, is the invention of a Belgian

lady, and has the bottom of the hull shaped like a figure "3" laid on its back. This hydroglider, still under construction, has exceptionally luxurious cabin

accommodations, and is distinguished by the fact that its aerial propeller is driven by a rotating air-cooled engine, such as were used on airplanes, particularly in France, before the war.



All-Metal Hydroglider on Exhibition at Paris Aero Show: It was Specially Designed as a Racer

Twenty years ago the first sardine-fishing boat with a gasoline engine to appear at Eastport, Me., which is the center of the sardine industry of that state, chugged up the harbor. Today the entire fleet of such boats, estimated at 1,800, is equipped with gasoline, kerosene, or crude-oil engines.

DRILL PRESS MOUNTED ON AUTO FOR ENTERPRISING SALESMAN

"Seeing is believing," may be an old saying, but it has been proved a true one by a tool salesman of Cleveland, Ohio.



This Drill Stand Holding a Portable Electric Drill was Placed on a Salesman's Car for Demonstrating Purposes

Discovering that his prospective customers were inclined to be skeptical of mere catalog photos and descriptions, he decided to use practical methods. Accordingly, a drill-press stand was attached to the running board of his automobile, and a portable electric drill was placed in the stand. Thus he was enabled to give convincing demonstrations, which resulted in increased orders.

SOCIAL LUNCHEON SERVED IN SIXTY-FOOT BOILER

Members of a social colony in New York City were the guests, not long ago, at a luncheon, given by the officials of a power company, which was served in the firebox of a 60-ft. boiler. Certain of the guests, residents of the neighborhood, had complained of the smoke and cinder nuisance prevailing because of the proximity of the company's power plant. The gathering in the boiler was for the purpose of demonstrating that every known appliance for the prevention of these inconveniences had been installed. The demonstration and luncheon proved a success, and apparently all points of friction were amicably smoothed over.

NEW METHOD OF RATE CHANGES FOR FOREIGN MONEY ORDERS

Because of the rapid fluctuations in foreign exchange rates, a new conversion table and system of changing foreign money-order rates has been adopted by the Post Office Department, which will save purchasers considerable loss. The tables have been sent to all international money-order offices. Rate changes are reported to central offices, in different zones, by wire. These offices notify all others in their zone by mail. The complete notification, which formerly required two weeks, is now accomplished in two days.

SIMPLE CHART FOR FIGURING PAY ROLLS QUICKLY

Offices may save time in figuring pay rolls by the use of a new calculating chart. It is mounted on a cast-iron base with a felted bottom. A case, of enameled sheet steel, revolves on this base and the charts, of extra-heavy cardboard, slide in and out of it with a slight pull on the index tabs. On the edge of the case are celluloid strips, listing hours from 1 to 99. On the cards are columns showing wages at rates from 12½ cents to \$1.50 per hour, for hours from 1 to 99. The card is pulled out till the proper rate column is opposite the hour column. The proper num-



The Calculating Chart Takes Up Little Space and is Easily Moved Wherever Needed

ber of hours is located and the total read opposite. Similar charts are provided for other kinds of calculations.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.



HUGE CASTING CARRIED COÖPERATIVELY BY THREE CRANES

IN a large foundry recently, the difficulty of lifting and moving a huge casting, weighing 225 tons, was overcome by doing the work cooperatively with three overhead traveling cranes, two rated at 60 tons each, and one at 40, thus overloading them about 40 per cent. From two of the cranes was suspended a plate girder that carried the heavier end of the casting, and a similar plate girder was lashed to the other end, and was carried by the third crane. The casting was for a large engine bed.

7722 *Atlas. Chalmers Foundry, Milwaukee Wis.*

GRANITE ARCH TO MARK STATE LINE ON MERIDIAN TRAIL

Marking the point where the Meridian Trail crosses the line between Illinois and Wisconsin, a granite arch will be erected as a gateway to the two states. This highway, which will probably prove to be the first hard road linking Canada with the Gulf of Mexico, after passing through Wisconsin and Illinois, will continue along the Mississippi River to New Orleans. Twenty miles of it, between Rockford, Ill., and the state line, have been surfaced with concrete and opened with a dedication ceremony on Nov.

11, 1921. A large part of it has been completed through Wisconsin, and much of the Illinois section is to be finished next summer. The design for the arch, which is to cost about \$8,000, has been approved.



Architect's Drawing of the Meridian-Trail Gateway between Illinois and Wisconsin. Inscriptions on Each Side of the Arch will Inform the Tourist He Is About to Enter Another State

Carl E. Pierson Bloomington Ill.

A SHALLOW-WELL OIL FIELD

By ALBERT MARPLE

716 S. Louis St.
 Escondido, Calif.

ONE of the most unusual oil fields to be found in this country is located in the hills between Conejo grade and Camarillo, Calif. The depth of the wells in this field ranges from 40 to 50 ft., and

3-in. pipe, all of the pipes emptying into a large tank.

The quantity of oil produced by these wells makes them a remarkably good investment. Many come in with 50 bbl.

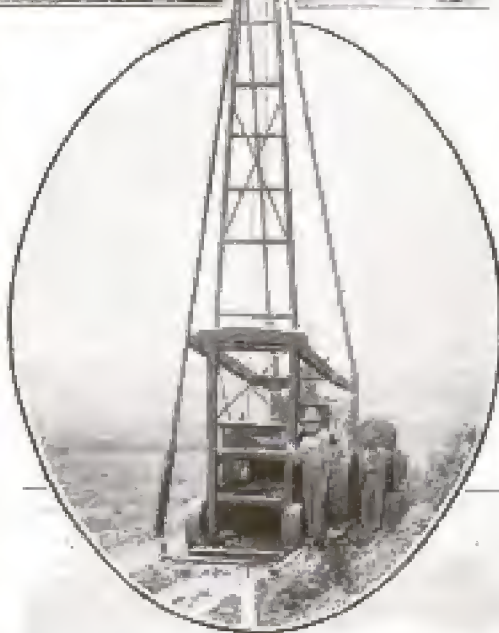
a day, and the average output is about 25 bbl. There are wells in this field that were drilled 20 years ago and are still producing a fair quantity of oil. This field is now paying so well that some wells which were abandoned 10 years ago are now being reopened and operated at a good profit. Six or eight wells can be placed on a single acre of ground here, while five acres are needed for the average deep well.



A Small Gasoline Engine Furnishes Power to the Pumps of an Entire Row of Wells through a Single Cable, Which is Fastened to the Pump at Each Well

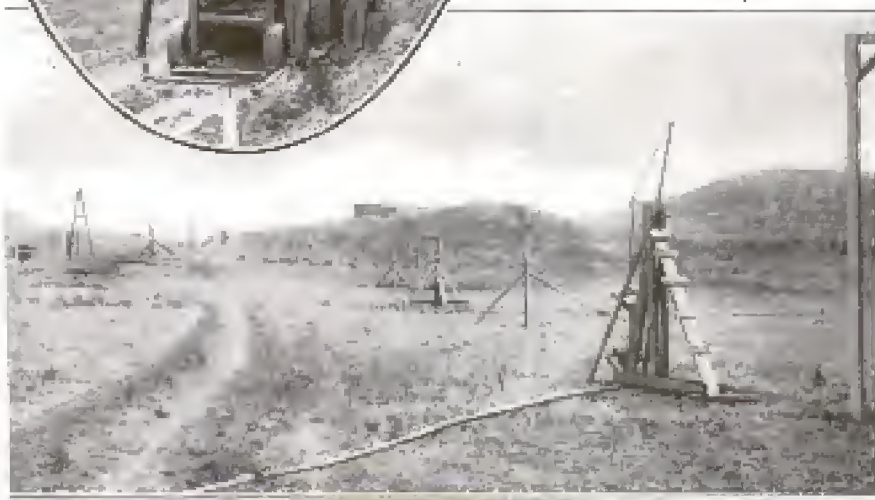
oil is struck, usually, at about 30 ft. The oil is so close to the surface that, with the pump removed, a person can see it by looking down the 6-in. casing used in connection with all these wells.

In drilling such wells, a regular water-well drilling outfit is used. Two men are required for each rig, and it takes about a week to complete the drilling of one well. The average cost is about \$150. In some of the more level stretches of the field the wells are "set out" like an orchard, in rows about 50 ft. apart and with the wells in each row a like distance apart. For operating these wells a cable is run along an entire row. It is fastened to the pump at each well, so that all the wells in the string, a dozen perhaps, are pumped with one operation. From each well the oil is carried off by means of a



RUBBER TUBING EXCLUDES DUST AND MOTHS FROM CLOTHING

Clothing is perfectly protected from both dust and moths by a new wardrobe in which rubber tubing is employed as a means of sealing. The tubing is used as a cushion around the door of the wardrobe, with the



Above: An Ordinary Water-Well Drilling Outfit, Used for Drilling in This Shallow Oil Field. Below: The Wells are Set in Rows like the Trees in an Orchard

result that an absolutely tight joint is formed when the door is closed. These wardrobes are made as separate pieces of furniture or can be built into a house.

India Rubber Works
 12 Paper material

Cml. Charles d. Reid
221 Salem Ave. Dayton, Ohio
POPULAR MECHANICS
Paving Division, Detroit

249



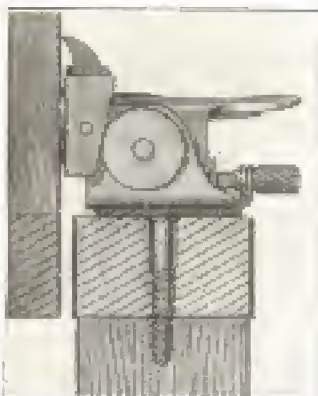
This Five-Ton Truck was Specially Built for Emergency Street-Repair Calls. The Inclosed Body Carries the Workmen Needed and Gets Them All to the Job at the Same Time and as Soon as the Materials Which are Hauled in the Dump Body

REPAIR TRUCK TRANSPORTS BOTH MEN AND MATERIALS

Emergency-repair calls, of the paving division of the city of Detroit, Mich., are answered by an unusual type of repair-truck unit. It is a five-ton truck with an ordinary dumping body operated by a hydraulic hoist. In front of this is an inclosed body which accommodates 15 workmen. In this way it is possible to reach a job with both the materials and men needed in a single run, and the men have a very comfortable means of transportation.

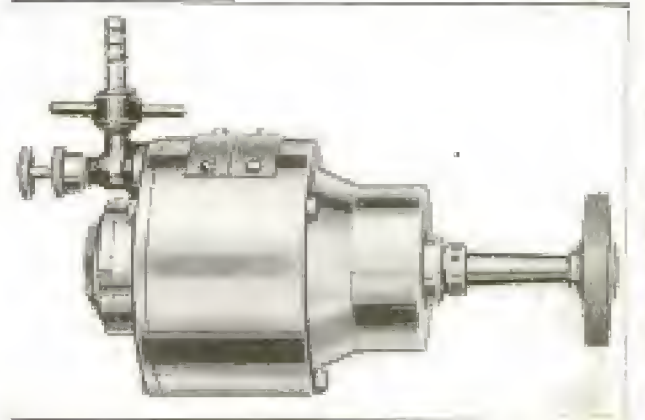
SASH HELD IN ANY POSITION BY AUTOMATIC WINDOW LOCK

An attachment to the top of the lower sash that automatically locks a window at all times, whether opened or closed, and that prevents it from rattling, is now on the market. The upper sash may be lowered, or the lower one raised, and in any position the attachment keeps both locked. To release the lock, when it is required to raise or lower the window, all that is necessary is to press a small lever.



SMALL TURBINE-TYPE GRINDER HAS SPEED OF 30,000 R.P.M.

Extremely high speed, without vibration, and consequently very high power in proportion to weight, are the distin-



Pneumatic Turbine-Type Grinder That Has a Speed of 30,000 Revolutions per Minute

guishing features of a new pneumatic turbine-type grinder. The turbine unit has an outside diameter of about 4 1/4 in., and weighs only 5 1/2 lb. At its extreme speed of 30,000 r.p.m., it transmits 1/4 hp. It can be used as a hand tool, and by mounting it on machine tools by various fixtures, work can be done in the original setting. In connection with a special mounting, it can be used as a bench grinder. It is provided with interchangeable arbors, allowing a quick change of grinding wheels. Besides grinding, the unit can be used for buffing and drilling.

Alum Mfg. Co. 39 State St.
Rochester, N.Y.

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General Machinery Works 3908 Salem St. Chicago



A Panoramic View of the New Crissy Aviation Field, at San Francisco, on the Former Site of the Panama-Pacific Exposition grounds. Consist of the Following: A, Boathouse Which will Accommodate the Speed Boats and H, the Landing Field; J, Living Quarters; K, Modernly

7256

Aeronautics

\$2,000,000 AVIATION FIELD RECENTLY COMPLETED

CRISSY FIELD, located on the old Panama-Pacific exposition grounds, has just been completed at a cost of \$2,000,000. The buildings, which are of fire-proof construction, include two hangars 160 ft. long and 100 ft. wide. They are equipped with rolling steel doors, each in 12 sections. One of the hangars is intended for seaplanes, having a concrete runway down to the bay. Special dollies

were made, to fit under the pontoons of the planes, which are towed by small tractors. Gasoline is supplied to the front of each hangar by two 10,000-gal. tanks, but for emergency use, two hand pumps are provided. A large garage has been built to take care of the trucks and trailers used. One of these trailers carries a complete photographic dark-room equipment, and is hauled by a truck carrying a 3-kw. gen-



An Airplane View of the New Crissy Aviation Field, Showing the Same Buildings Indicated by the Same Letters as Those Seen at the Top of the Page: In Addition, This View Shows, at B, Concrete Runway for Seaplanes; E and F, Living Quarters; G, the Wireless Station. The Beauty of the Site Is Apparent in This View

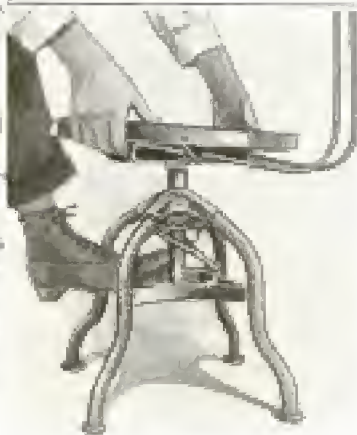


Exposition: The Buildings are Constructed of Reinforced Concrete and Steel and Are Fireproof Throughout. They Three of the Hydroplane Tenders; C, Hangar for Seaplanes; D, Hangar for Land Planes; Equipped Garage; L, the Machine Shop and Testing House

erator. Another truck, with two trailers, is especially designed for bringing in wrecked planes. The trailers have steel stands with padded bumpers to protect the wings.

NEW DEVICE EASILY ADJUSTS HEIGHT OF CHAIR

A new adjusting device for swivel chairs and stools is conspicuous for its simplicity of operation.



The seat is supported on a notched upright and held by a catch. To adjust its height, it is only necessary to trip the catch by means of a spring lever and raise or lower the seat as desired.

The device is made of steel throughout. Its easy operation assures adjustment to the most comfortable height for type-writing and various kinds of work.

NEW SYSTEM BURNS HEAVY OIL IN SMALL HEATING PLANTS

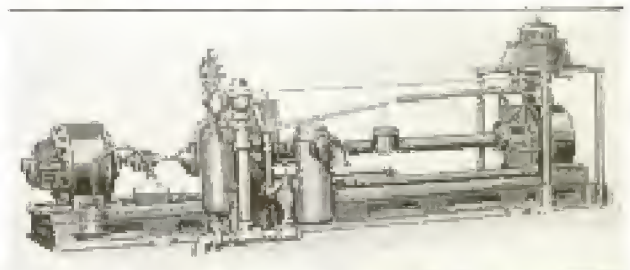
An oil burner has been placed on the market which, it is claimed, makes possible the use of heavy fuel oil for heating residences or firing any small boiler, in place of the lighter and more expensive oils, such as kerosene. An improved feed and atomizer eliminates the obstacle of clogging, by impurities, which has in the past limited the use of heavy oils to large installations and left only the light oils available for the small plants. Fuel is

drawn through a strainer into a compressor, and forced through a revolving needle valve into the feed pipe. The per-



Interior View of a Firebox Equipped with the New Oil-Burning System: The Revolving Cap of the Atomizer can be Seen in the Center of the Box

fection of this valve was the first step in making the burner possible. The atomizer system consists of a cup, about the outlet of the feed pipe, and a cap above, both of which revolve. Oil flowing into the cup is mixed with air, thrown up against the cap and out into the combustion chamber. Centrifugal force carries the dirt to the sides of the cup.



The Complete Oil-Burning Plant as It Appears Set Up, Ready for Installing under Any Boiler

Clogging here is prevented by an agitator. This is a small metal strip, attached immovably to the feed pipe, and bent upward near the sides of the cup.

When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

Hardinge Brothers
Bertalan & Oakeswood Ave.
Chicago

Bonney Forge & Tool Works

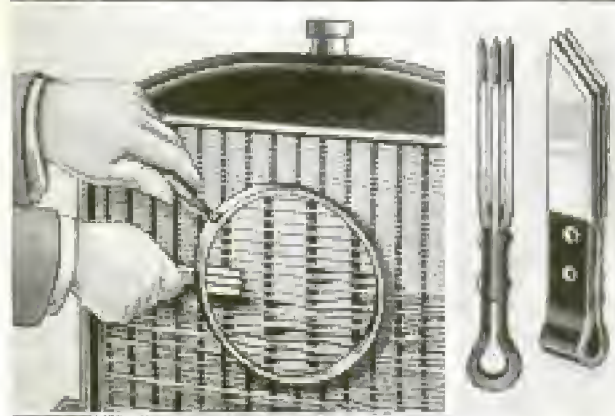
252
7770 Auto Access

POPULAR MECHANICS

Allentown, Pa.

SIMPLE TOOL TO STRAIGHTEN BENT RADIATOR FINS

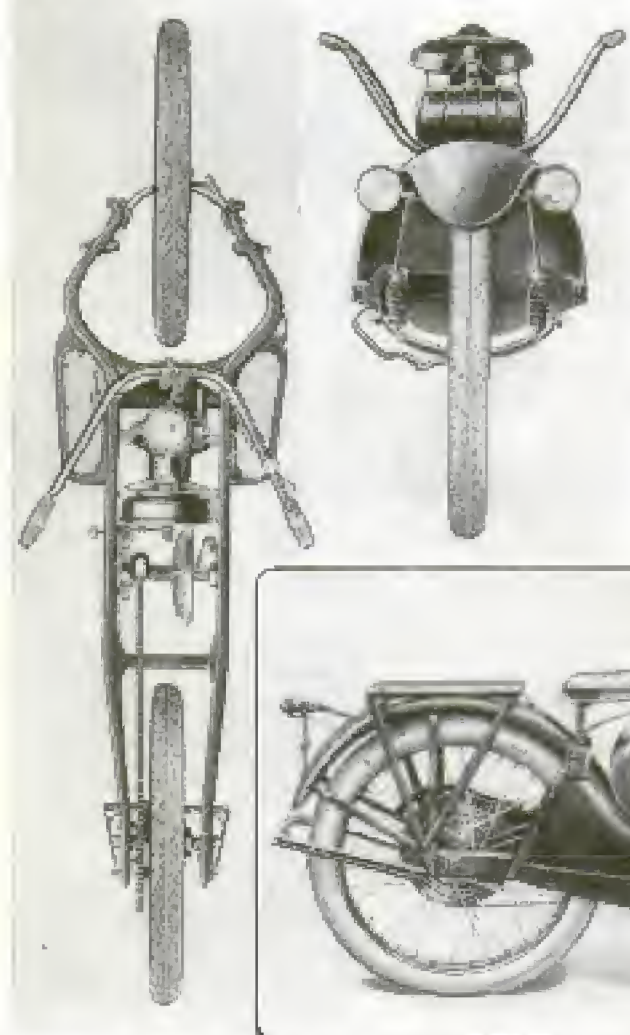
Bent radiator fins, on any automobile having a flat-fin radiator, may be straight-



Straightening Bent Radiator Fins: At the Right Two Views Showing How This New Tool is Made

ened quite easily with a small tool which was recently placed on the market. It consists of a flat piece of metal, bent

7622



double to form a handle and two prongs, or teeth. Another piece, inserted between the teeth, and held by rivets, forms a third tooth. In use the teeth are inserted between the bent fins and twisted from side to side.

7903

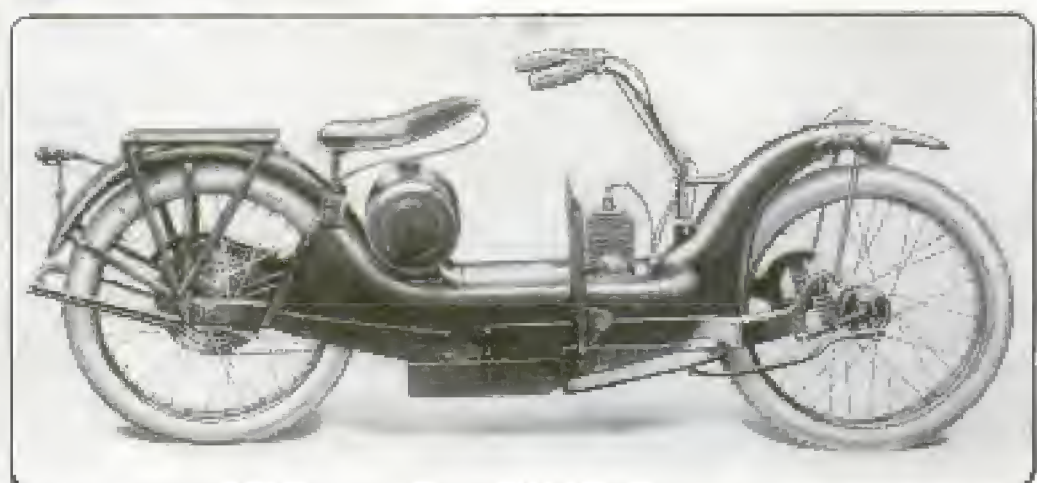
OIL-REFINERY EXPLOSION OF PECULIAR NATURE

Oil refineries usually protect the distillation tanks against the entrance of water, but a laxity of this safeguard recently resulted in an explosion of one of these stills. Water in the tank produced a rise in pressure, due to the formation of steam. The safety valve operated, but the opening in this was not of sufficient size to allow the steam to escape fast enough, and the still exploded.

7622 *Universal*

MACHINE FILLS GAP BETWEEN MOTORCYCLE AND LIGHT AUTO

Halfway between the heavy motorcycle and the light automobile is a new machine embodying a number of novel features. The frame, of the automobile type, is supported on two wheels. A barrel-type spiral-spring suspension eliminates the wheel fork. An extra-wide stationary front mudguard extends back, forming a hood for the engine, gears, and clutch. Power is transmitted from a one-cylinder 2 1/2-hp. motor through a friction drive and clutch. This machine is designed for cheap, clean, and comfortable transportation, not speed. It will give 85 to 100 miles from a gallon of gasoline and make 35 miles an hour. The low center of gravity reduces the danger of skidding.



Three Views Showing the Peculiar Features of Construction of a New Motorcycle Designed Primarily for Comfort, Convenience, Safety, and Economy of Operation: It Is Not a Speedster

Mer. A. Car Corp. 896 S. Ladder St.
Syracuse, N.Y.

Copyrighted material

Engineer 11/15/21

Price, \$225.00

EXTERMINATION OF CRAWFISH STOPS CANAL-BANK LEAKAGE

Trouble is sometimes caused by the presence of crawfish holes, under water in canal banks, which cause leakage, and to eliminate these an experiment has been made that successfully exterminated the crawfish in a canal embankment 75 years old. After unsuccessfully attempting to stop the leakage with sheet piling and concrete, it was finally decided to try impregnating the soil with enough chloride of lime to kill the crawfish. It was necessary to get the lime down 16 ft. under water, and this was done by boring with post-hole augers. With these a barrage of holes filled with lime, and scattered through the earth with dynamite, was laid across the paths of the crawfish. This stopped the leakage.

COMBINATION WALL REGISTER DOES NOT CUT INTO WALL

In the warm-air furnace-heating systems in common use, the registers are either in the floor or in the wall. Now there is a dual register that is partly in the floor and partly set against the wall. The part against the wall is the outlet for the warm air, and



the part set in the floor is for the inlet of the return air.

THE "FINGERPRINTS" OF THE MURDEROUS HOUSE FLY

A casual glance at the picture herewith would lead one to believe it was a bird's-eye view of a shell-devastated portion of France, but such is not the case. It is a record of the footprints, or "fingerprints" if you please, of the common house fly—murderer, food despoiler, and baby killer.

The fly was caught last fall and made to walk over a prepared medium of agar. Wherever its feet touched the medium a colony of bacteria grew. The performer of this experiment isolated 13 kinds of harmful bacteria from the footprints.

The picture also tells another story: While the fly left its footprints, it also

left a memento of its approaching doom. The two large spots are mold colonies of the *Empusa musca* variety. Each fall

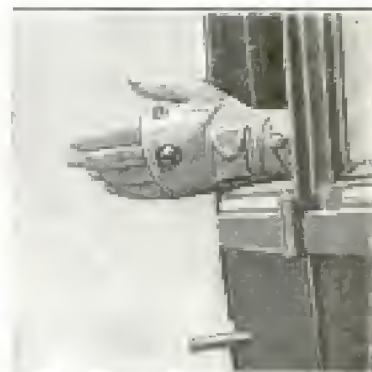


Footprints of House Fly on Bacteria-Breeding Gelatine: Every One of the Little Dots Represents a Colony of Bacteria Carried by the Fly's Feet; the Large Spots Are Growths of a Mold That Causes the Death of the Flies

this mold starts to propagate, and the spores float through the air. They attach themselves to the fly under the wings, and start growing inside its body. In a short time the fly becomes so weakened that it can scarcely crawl. Finally, it stops, but the white shroud of fungus keeps on growing. If some scientist could so cultivate the mold that it would start its work in the summer, the pestilential fly would soon disappear.

MOTOR GLOVE HAS FLASHLIGHT IN BACK FOR SIGNALING

Quite novel among the automobile signals which have been developed lately, is a glove with a small flashlight set in the back. It is provided with a red bulb and operated by pressing a push button, placed under the thumb. It is used to warn cars approaching from the rear that the driver intends to stop or turn. The battery is said to be sufficient for 2000 flashes.



Cont. Lias B. Chase
 819 Lawrence St.
 St. Louis, Mo.

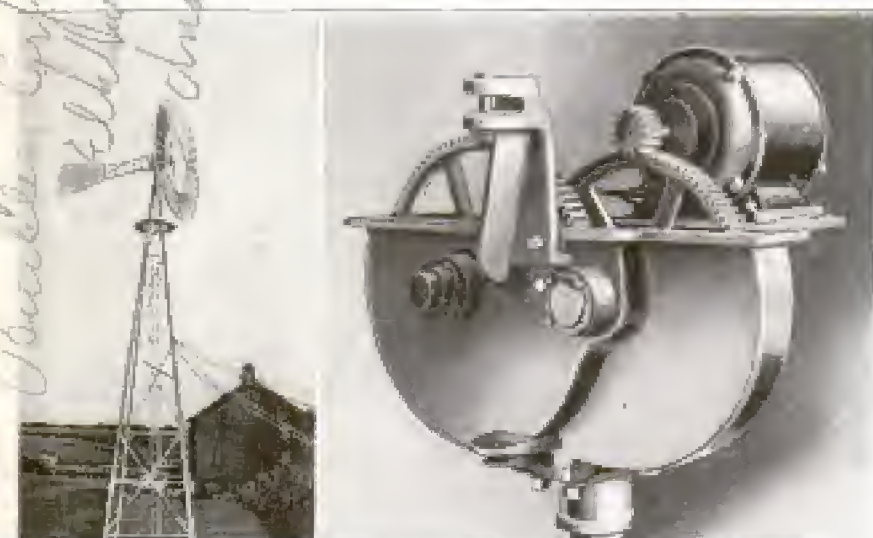
Block of sand registers of sand, D. H.
 2435 - 24th Ave.

1005 Bridge
 Ocean Bank
 Banner Sales
 1612 - 16th Ave.
 St. Louis

**WINDMILL STORES ELECTRICITY
FOR ELEVEN DAYS' USE.**

Although there have been many attempts made to harness the wind to generate electric power, yet work along this

use it as required about the farm. On the main casting at the top of the tower is mounted a 1-kw. generator. It is geared directly to the shaft of a 14-ft. steel windmill. The spur gears are carried on roller bearings, the entire reduction gearing running in an oil bath. The generator gives a constant voltage over a speed variation ranging from 750 to 2,500 r.p.m. The storage battery has a capacity of 280 ampere-hours and will store enough electricity to operate the lights on an average farm for 11 successive days without wind. This is a condition of weather seldom, if ever, encountered. The collector ring is so designed that it allows the wheel to turn and face any wind.



Left: The Steel Windmill. Right: The One-Kilowatt Generator and the Reduction Gears Which are Directly Connected to the Windmill Shaft. The Lower Parts of the Gears are Immersed in Oil

line is still in the experimental stage so far as actual farm installations are concerned. Thus considerable interest is attached to the announcement made by a windmill manufacturer that he has at last succeeded in constructing a model that, he believes, will meet all the requirements in this special line.

The combined windmill, generator, and storage-battery outfit is designed to transform the wind power into electric energy, store it in storage batteries, and

use it as required about the farm. On the main casting at the top of the tower is mounted a 1-kw. generator. It is geared directly to the shaft of a 14-ft. steel windmill. The spur gears are carried on roller bearings, the entire reduction gearing running in an oil bath. The generator gives a constant voltage over a speed variation ranging from 750 to 2,500 r.p.m. The storage battery has a capacity of 280 ampere-hours and will store enough electricity to operate the lights on an average farm for 11 successive days without wind. This is a condition of weather seldom, if ever, encountered. The collector ring is so designed that it allows the wheel to turn and face any wind. Main wires lead down from the collector ring to the switchboard and battery. The switchboard is very simple and is provided with cut-out switch, ammeter, voltmeter, and a specially designed relay which permits the apparatus to charge at 16 volts in moderate winds and automatically change over to a 32-volt charge in winds of 18 miles an hour or more. This makes it possible, according to the inventor's claim, to take advantage of all wind conditions, and get maximum charging efficiency from winds ranging from 7 to 30 miles an hour.

**BASEBALL SCENE WHITTLED
FROM WOOD WITH KNIFE**

For 12 years August Bruyere, of Green Bay, Wis., devoted his spare time to re-

producing a baseball game in wood, with a jackknife as his only tool. The scene represents a double steal with the runner out at home. The field is 8 ft. square and is painted grass-green, except the base lines which are of sand color, and the bases and pitcher's slab which are gray. Each figure is 6 in. high. The players having the field have light cream-colored suits, and blue socks, belts, and caps. Those at bat have light gray suits, and green socks, belts, caps, and sweaters. The umpire is dressed in dark blue.



A Baseball Game Carved in Wood, Which Is the Product of Many Hours of Patient and Skillful Work, with a Jackknife as the Only Tool

Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

7459 Cml. E. E. Pierson
Bloomington, Ill.



The Illinois Waterway as Seen from a Point in Marseilles, La Salle County, Where the First of the Five Locks Connected with the Enterprise is Now being Built near the Bend in the River Seen in the Background: The Lock will Be One of the Largest in the World

FIRST LOCK BEING BUILT FOR ILLINOIS WATERWAY

IN connection with the Illinois Waterway—the \$20,000,000 improvement of river navigation authorized in 1919—the excavations for the first lock are now in

progress at Marseilles, La Salle County. The lock will be 600 ft. long from gate to gate, with an over-all length of 938 ft., and a width of 110 ft., making it nearly



Excavations in Connection with Initial Work on the First Lock, near Marseilles, La Salle County, for the Illinois Waterway Improvement That will Make It Navigable for Large Steamers from Chicago to the Gulf of Mexico: The Lock will Be Parallel with the Illinois River, Which Is in the Background near the High Tower

Engineers - Leaven & Sons, 332 & Michigan Ave Chicago

the size of the Panama Canal locks. It is situated at some distance from, and parallel with, the Illinois River, to which it is connected above and below by channels, 40 or 50 ft. wide, which will have a difference in level of 21 ft. At the low level there will be 14 ft. of water over the lock sills, and the walls will be 50 ft. high. The lock will be filled and emptied by means of conduits, 12 ft. in diameter, built into its concrete walls. The lock is on the south side of the river, and as the railroads are all on the north side, a spur was built to the bank, and a temporary bridge was thrown across the river, as well as a 1,400-ft. span cableway. The bridge is in sections, which can be removed at flood time. The concrete mixing plant is on the north side of the river. Its two 1-yd. mixers are installed so that $\frac{3}{4}$ -cu.-yd. trucks can run under them and

receive their loads. Concrete construction on this lock started in September. It is expected that the lock will be finished by Oct. 1, 1922. The whole project is scheduled to be completed some time in 1926, when deep-water navigation will be open from Chicago to the Gulf.

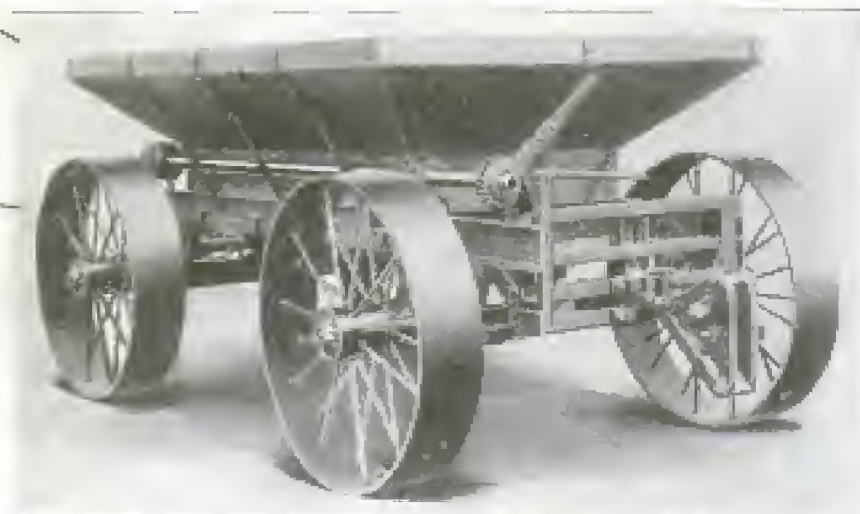
The course of the Illinois Waterway extends from the power plant of the Sanitary District of Chicago, near Lockport, to a point on the Illinois River near Utica. At the junction of the canal with the Desplaines River, it passes through the city of Joliet, and thence along the course of the Illinois River until Utica is reached. The channel of the waterway will have a minimum width of 150 ft., but through Joliet this width is to be increased to 270 ft., in order to provide room for dockage at wharves on either side, without interfering with the passage of vessels.

7111

NEW TRAILER HAS WIDE RANGE OF ADAPTABILITY

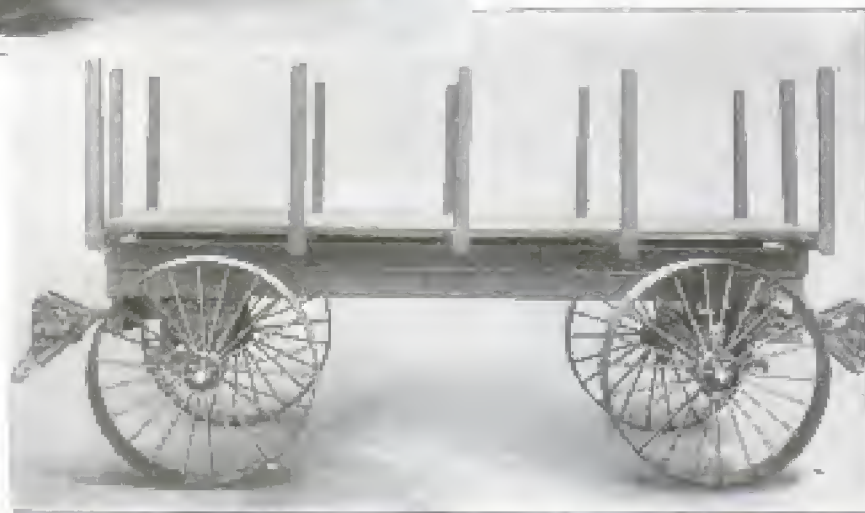
A trailer, specially designed for heavy duty with tractors, in trains of from four to eight, embodies a number of features

The rear drawbar and wheels are locked in a central position by means of a locking pin, and slots in the drawbar and drawbar rest. Those which happen to be in front are left free to swing. Two heavy coil springs at each end take up all torsional strains. A hinged link connection, between each two trailers, folds back within the drawheads, so that, in backing, they come in contact and form a connection of ample rigidity to meet any demand placed upon it.



The Heavy-Duty Trailer Equipped with a Hopper Dump Body Which can be Quickly Removed from the Frame

which give it a wide range of adaptability. This trailer is provided with a hopper dump body. By removing a few bolts, the hopper body and dumping mechanism may be removed, leaving an all-steel frame, upon which any sort of body can be mounted. A drawbar at each end makes the unit reversible.



The Hopper is Replaced by Any Other Type of Body. A Drawbar is Provided at Each End for Making Up Trains. Both Pairs of Wheels Are Movable, but Either can be Locked, Making the Unit Reversible

Miami Trailer Co., Troy, N.Y.



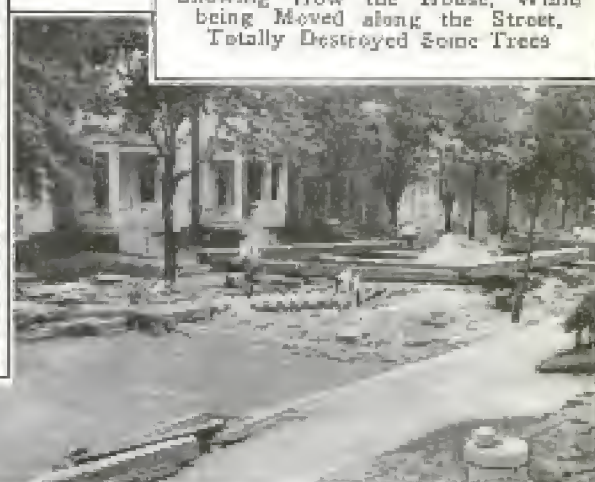
House being Moved along a Street in Newark, New Jersey: The Building Was So Wide That It Played Havoc with the Trees on Either Side



Showing How the House, While being Moved along the Street, Totally Destroyed Some Trees



Above: Residents of the Neighboring Houses Beginning the Wreckage of the House. Right: All That was Left of the House

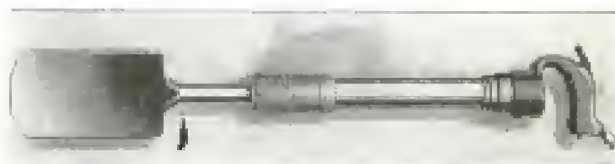


HOUSE-MOVING ENTERPRISE WITH UNEXPECTED ENDING

House moving along streets in a city is generally accompanied by a certain amount of excitement, but not often to the degree that was caused recently by the attempt to move a house along a Newark, N. J., street, where the building itself was so wide that it damaged the trees that lined the road on either side of it. After traveling about 50 ft. from its original location, the damage done aroused the neighboring residents to such a degree that they first caused the city authorities to order the work stopped, then gave the owners of the house a certain time to do something about it. When this time expired and nothing had been done, they did something themselves—so effectively that, at the end of the doing, there was not a vestige of the house left at a higher level than three feet.

CLAY DIGGER RESEMBLES PNEUMATIC HAMMER

A clay-digging tool that is said to do work equivalent to that of seven men digging by hand, is now on the market. It is similar in principle and appearance to the ordinary pneumatic riveting hammer. In place of the hammer is a spade. It has a long stroke, and its speed is 800



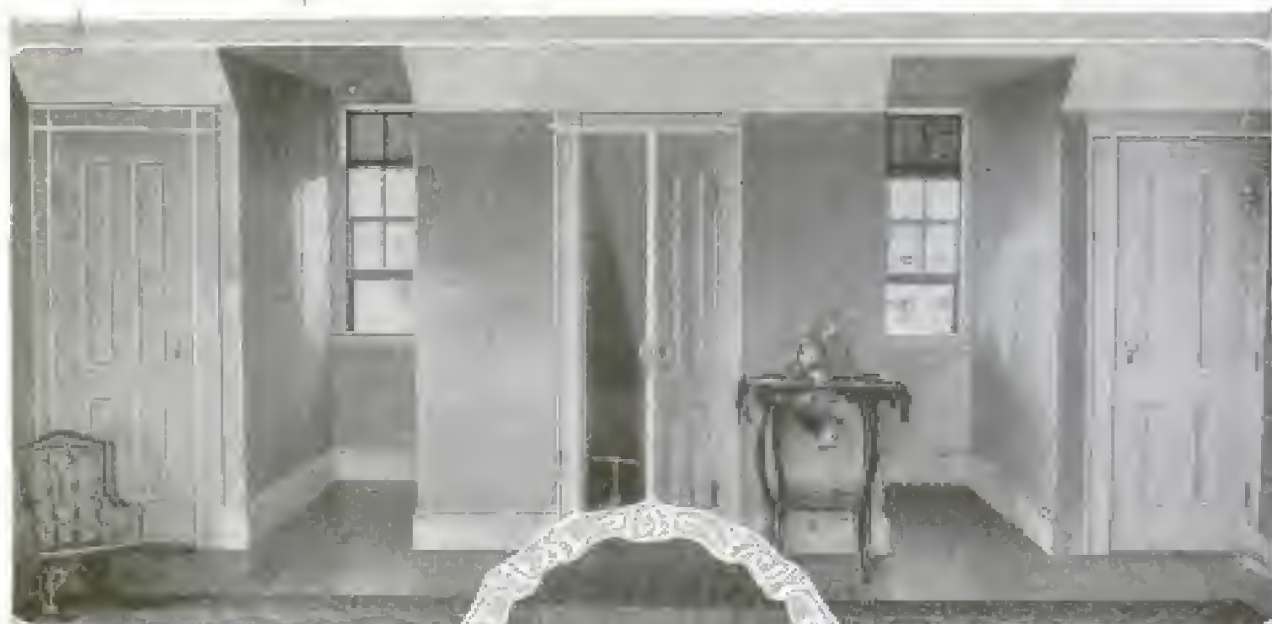
Clay-Digging Tool That Is an Adaptation of a Pneumatic Riveting Hammer, with a Spade in Place of the Hammer: It Strikes 800 Blows a Minute

blows a minute. Like the pneumatic hammer it can be operated in a space too limited to swing a pick.

Chicago Pneumatic
Tool Co 6 E. 49th St.
New York

5294

Cont. Jane Frederickson
 1822 Curson Ave. Los Angeles, Calif.
 CAMOUFLAGE CONVENIENCES CHARACTERIZE



Above, Left and Right: A Model Nursery and Playroom. Though the Toys may be strewn from one end to the other one moment, the next sees the room spick, span, and tidy, everything being whisked into the three closets, one of which may be for new playthings, the second for those not quite so fresh, and the third for such as are in need of repairs.

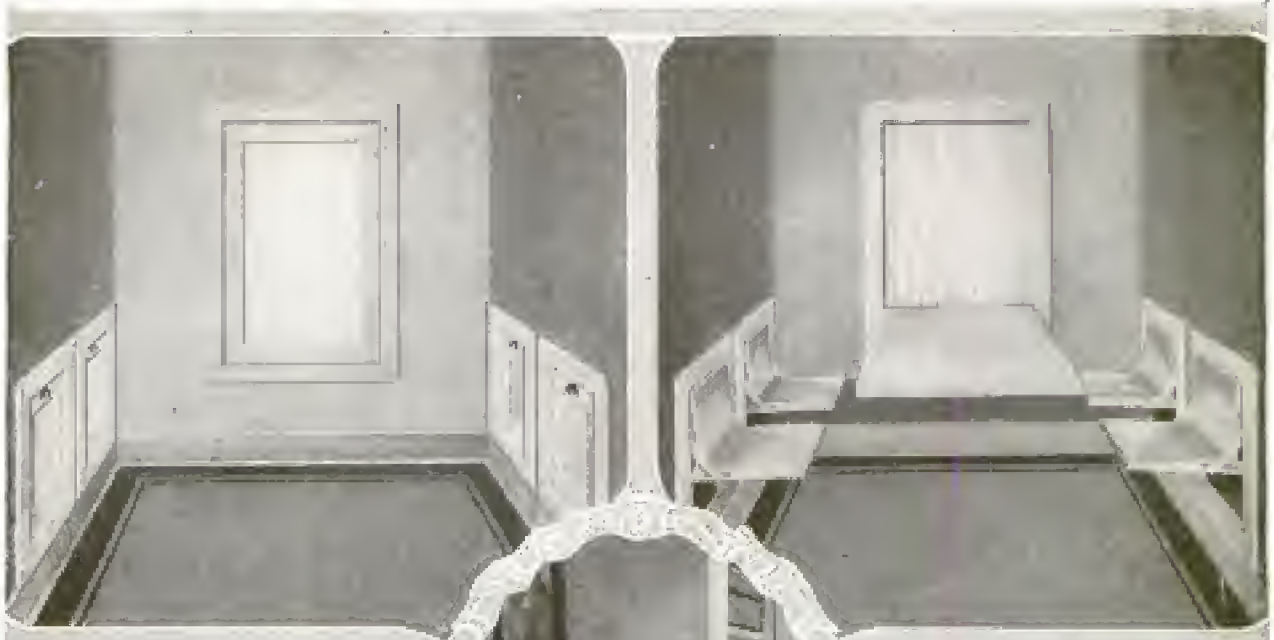


Left: What in most dwellings is an unlovely spot, buried away under the eaves, in one home has become an attractive attic nook, fitted with shelves for the storage of seldom used odds and ends, and a long rod, well supplied with hangers, where out-of-season garments are disposed, out of the way, protected by moth and dust-proof bags.



A concealed stairway affords access to attic storeroom. Finished on its underside with a full-length panel, matching the rest of the woodwork, it gives no hint of its existence when it is folded up. Right: The cord, which passes over a pulley in the attic, has a counterweight attached to it. A slight lift on the stairway sends it up into its niche, where the counterweight holds it securely.

MODERN CITY AND COUNTRY RESIDENCES



Above, Left and Right: A Masterpiece of Interior Camouflage. One Not Familiar with the Design would Never Suspect That He Was in the "Fade Away" Breakfast Room of a Cleverly Thought-Out Dwelling. With the Family and Guests Assembled, the Signal is Given, and, Perata, the Wall Panels Drop Outward, and the Room Becomes a Dining Hall.

Left: The Fireplace Is a Concession to Sentiment and Custom, and Serves No Useful Purpose Other Than to Mask a Tiny Closer Built behind It. Here are Kept in Orderly Array, Always Findable When Wanted, but Never Underfoot Causing Vexation and Unnecessary Work in Moving Them About, Those Hundreds of Little Things Which So Often Clutter Up the House.



A Camouflaged Sewing Room: At First Glance One might be Led to Believe That This Is a China Cupboard or Buffet. However, the Lady of the House Knows Better, and could, If She Chose, Disclose the Interior of a Well Arranged, Though Somewhat Large, Sewing Cabinet, by Pulling the Panels Down and Outward, from the Top, into the Lowered Position Shown at the Right.

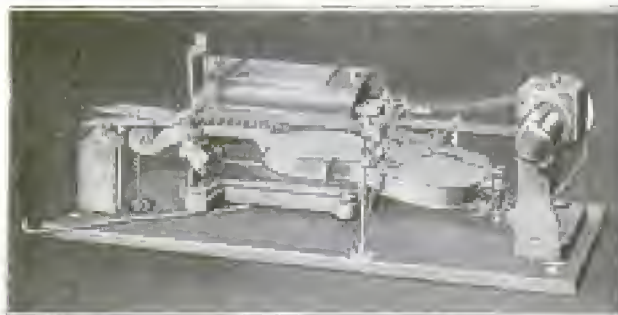
260 7582 POPULAR MECHANICS
Chicago
GROUP-CONTROL METHOD
OF PLAYING VIOLINS

Essentially different from anything in the nature of an automatic musical instrument is a new group-control violin



Console by Means of Which One Musician Plays Any Number of Violins; Electrical Control Is by the Switches above the Keyboard and by the Three Pedals

player that was recently demonstrated in Chicago, as the first-violin basis of an orchestra of 30 pieces. The new instrument, singly or in groups, is played from the keyboard of a console by means of which the musician's fingers do exactly the same things—and more of them—that are done by a violinist with the instrument in his hand. Moreover, from one keyboard one performer can play any

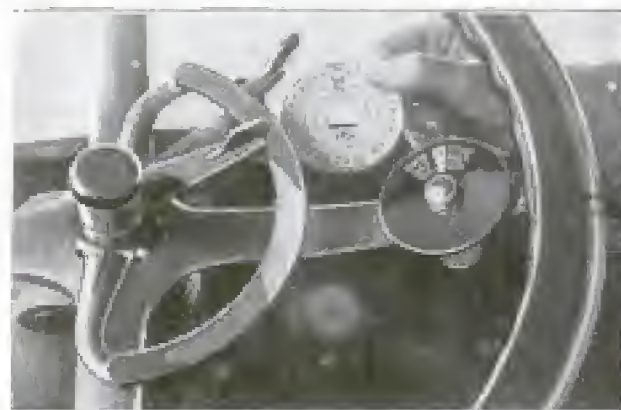


Violin That is Played Electrically from a Console at Any Distance: At the Right Is the Motor That Rotates the Bow Disks. At the Left Are the Mechanical Fingers

number of violins. Each violin is a complete unit, and is mounted on a stand that is connected with the console by an electric cable controlled by a switch. A small motor on the violin stand rotates four celluloid disks—one to each string—that take the place of the ordinary bow, but do what that can never do, because they can play all four strings at once. Under the strings, instead of over them, are the fingers that are electrically controlled by the keyboard and by switches on the console, enabling the performer to get all the usual bowing effects. Further control is by means of three pedals, one piano, one forte, and the other for playing progressively, or simultaneously, on any number of violins desired, when there are more than one connected to the console.

7689
ACCESSORY HELPS MOTORIST
TO KEEP DAILY RECORD

Motorists who wish to keep a handy record of the daily expense and mileage of their cars, can do so with the use of an accessory recently placed on the market. The accessory has a paper disk divided into 31 parts, representing the days of the month. The miles traveled, and any purchases of gasoline or oil, are recorded upon the disk, which is revolved to the proper date by turning a thumb-screw on the top. At the end of the



Removing the Disk from the Daily Recording Accessory to Ascertain the Month's Expenditures for Gasoline and Oil, and Miles Traveled

month, a complete record is found on the card of the total expenditures, and the mileage.

At Port Etienne, in the French West African colonies, the center of a growing fishing industry, a former French cruiser has been anchored in the bay and turned into a fish-drying factory. Sixty tons of fish can be dried on its decks at one time.



One of the Auto-Wheelbarrows Designed for Paving Work in Long Beach, California, Which have Proved Economical of Both Time and Labor: They are Built on Standard Light Motor-Truck Chassis and are Equipped with a Hopper and Dumping Mechanism.

7317
**AUTO-WHEELBARROW IS LATEST
TYPE OF DUMPING TRUCK**

Auto-wheelbarrows, designed by a contracting firm, are really miniature dumping trucks with a new arrangement of their parts. The machine is built on a light-truck chassis, with the driver's seat at the rear, back of the wheels. The engine is placed between the front and rear wheels, and the hopper is in front of the engine, directly over the front wheels. The dumping mechanism is operated by means of a lever. These machines have a much greater capacity than the ordinary wheelbarrow and have proved economical of both time and labor. They are used for carrying materials to concrete mixers, and the load can be dumped directly into the mixer skip.

7810
**CAFETERIA IN YOSEMITE PARK
POPULAR WITH TOURISTS**

The first cafeteria ever established in a national park was operated last season in Yosemite Park. It proved so successful that others will probably be established in national parks throughout the country. Its purpose was to supply meals to park employees, about half the patrons, and to tourists and campers, at the lowest possible cost. In five months 250,000 meals were served at an average cost of about 48 cents each.

Columbus shippatch
10/23/21

7701
**A SIXTEEN-SHOT REVOLVER
MADE IN BELGIUM**

A Belgian concern is manufacturing a revolver which enables the user to fire 16 bullets without reloading. The arm has two barrels, one above the other, registering with two series of eight holes each in the cartridge chamber. It is fitted with a double firing pin, and the bullets are fired alternately from the inner and outer circles. When all the cartridges have been discharged, the empty shells are thrown out all together by pressure



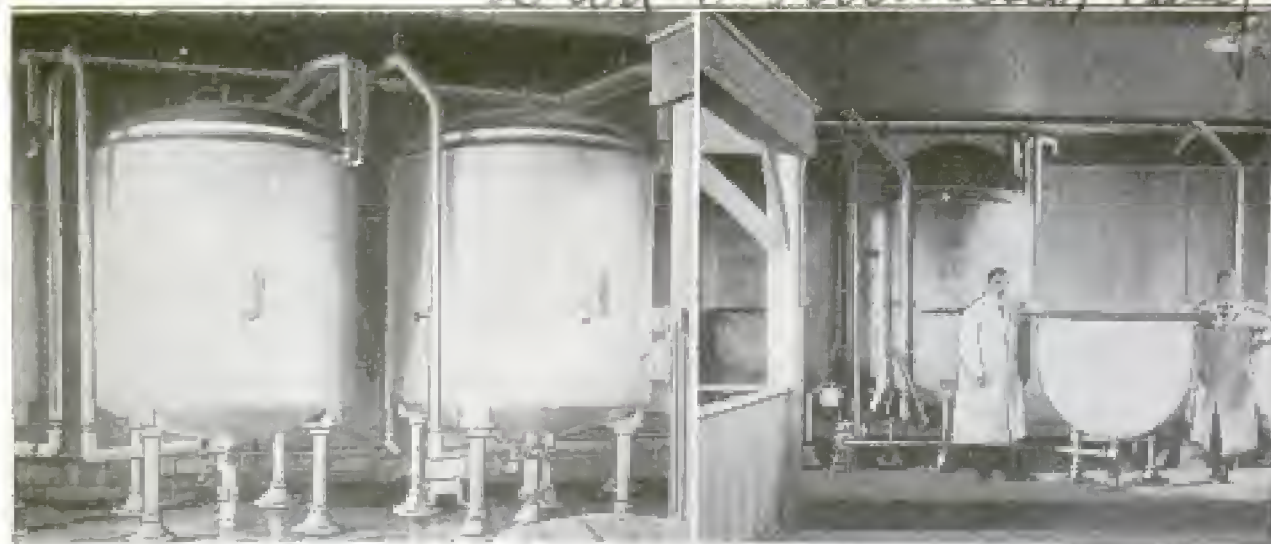
COPYRIGHT, PHOTO ACAPRIAS BELGE
The 16-Shot Revolver Broken, to Show the Arrangement of the Two Circles of Cartridge Chambers

on an ejector rod. The caliber of the gun is .32. A similar type of arm fires 20 bullets without reloading, but is of somewhat smaller caliber.

□ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago

Agents Maurice E. Delgrosso
Antwerp, Belgium

The Nucoa Butter Co. 1964 Bryant St.
San Francisco, Calif



Glass-Lined Preparation Tanks, in Which Coconut Oil is Alternately Heated and Cooled, the First Step in Making Coconut-Oil "Butter," are Shown at the Left. The Pump and Pipe, at the Right, Used in Filling the Tanks, are Taken Apart and Cleaned Immediately after being Used

HOW COCONUT-OIL BUTTER IS MANUFACTURED

BY C. W. GEIGER,

815 Mason St.
San Francisco, Calif

THOSE not interested in the manufacture of butter from coconut oil have probably forgotten that the price of the natural product has advanced con-

soap; so they worked out secret formulas by which they have manufactured the butter by the thousands of tons. In the United States the process is of more re-

cent introduction, but is now conducted quite profitably on the western coast, where the "copra," or dried coconut meat, is received directly from the islands of the South Pacific.

San Francisco is thus the home of the factory illustrated on these pages, and considered to be one of the most efficient in the United States. This



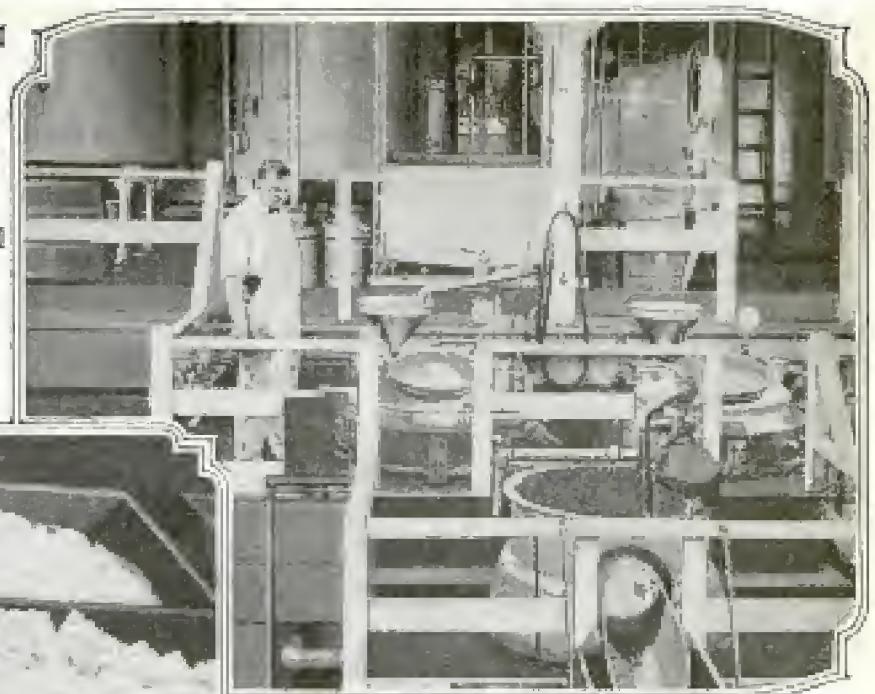
On This Revolving Kneading Table, Excess Water is Forced Out of the Mass of Crystallized Oil, and Salt is Worked into It

siderably in the last few years. In view of present conditions, the growing use of this substitute is worth the attention of every sufferer from the expensive habit of eating food. As a matter of fact, producers in Germany and France learned several years ago that coconut oil made edible butter as well as good candles and

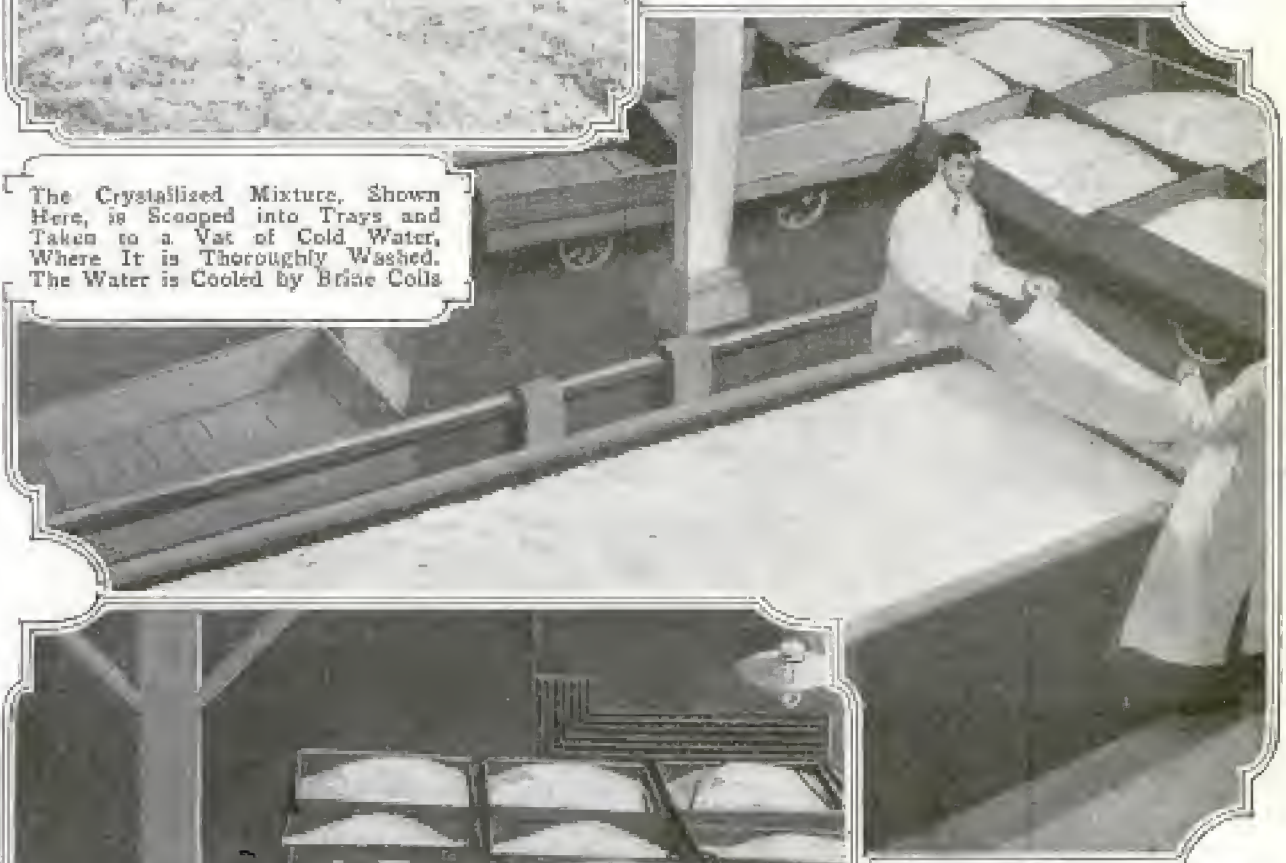


After being Cut into One-Pound Bricks, the Finished "Butter" is Placed on an Endless Belt Which Moves down the Center of a Wrapping Table. Girls, Sitting along the Table, Pick the Bricks from the Belt and Wrap Them

From the Preparation Tanks the Oil is Pumped into Churns and Mixed with Milk. The Man is Standing beside the Churns. The Mixture is Pumped into the Centrally Operated Glass-Lined Crystallizer, in the Fore-ground, Where It Forms Crystals



The Crystallized Mixture, Shown Here, is Scooped into Trays and Taken to a Vat of Cold Water, Where It is Thoroughly Washed. The Water is Cooled by Brine Coils



After the Crystals have been Washed in the 20-Foot Vat, Which is Shown Above, Two Men Again Scoop Them into Trays, Mounted on Wheels, and They are Taken to a Room, Where They are Allowed to Stand from 20 to 26 Hours

While Standing in the Trays, the Crystals become "Tempered" and Take On the Aroma of Butter. They are Then Taken to the Kneading Table for Final Preparation



concern is unusual, too, in pressing out the oil at its own mill, from which the heavy, ill-smelling liquid is hauled in special tank wagons to the factory. Here it is stored in great glass-lined tanks until needed, when the oil is pumped into preparation vats, also glass-lined, in which it is alternately heated and cooled by steam and brine pipes. Then comes treatment in churns where 30 per cent of milk is added, this mixture passing into a "crystallizer" where contact with cold water converts it into solid "crystals."

Scooped into trays, these crystals are then set out for 20 to 26 hours, permitting the butter aroma to penetrate thoroughly. At the end of this period the crystals are placed on a broad table where rollers and knives knead them into appetizing butter, pressing out excess water and working in the salt. To permit handling, the butter is then hardened in a freezing room; later cut into the one-pound portions of commerce, and finally placed on a wide, moving belt, from which it is seized and wrapped by quick-fingered girls.

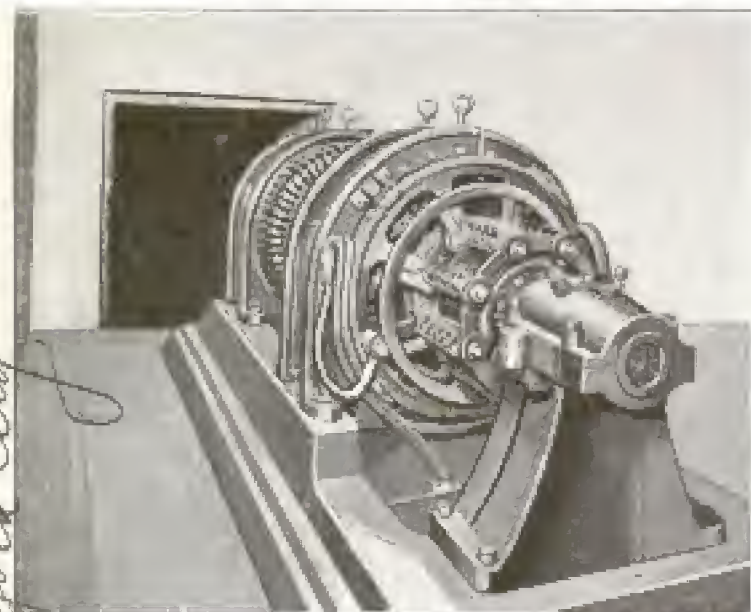
Power. Electric

AUTOMATIC SUBSTATION IN AMERICAN COAL MINE

Far back under the coal-veined hills at Nanty Glo, Pa., a powerful substation

central-station lines, the substation will automatically shut down. In like manner whenever the power comes on, the substation will automatically resume operation instantly and pick up the mine load. Thus power conditions at the load centers are greatly bettered, consumption of power is trimmed down, and the service of attendants is made unnecessary. The first day's operation of the station showed an increased production of 200 tons.

This motor-generator set operates in parallel with engine-driven generators in the power plant near the drift mouth. The compounding of the motor-generator set is so designed as to throw the maximum load on the power plant. Thus the motor-generator

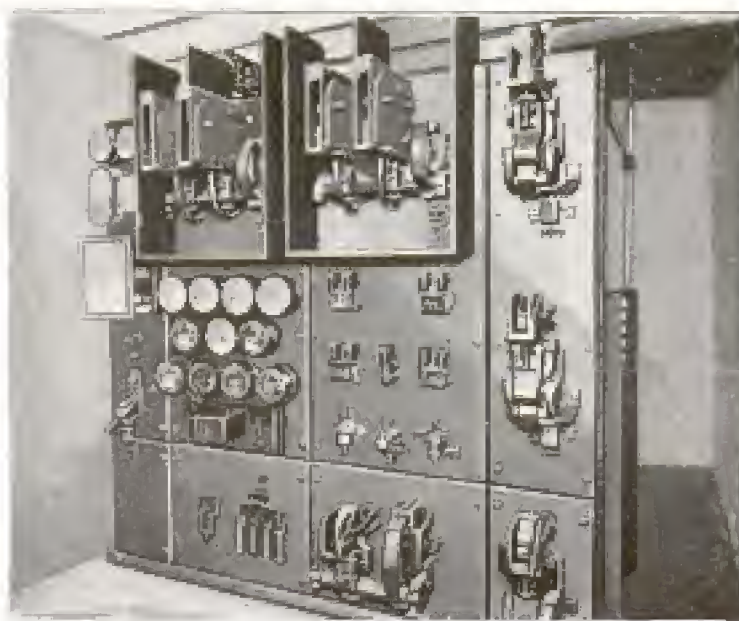


Motor-Generator Set at Automatic Substation in a Coal Mine at Nanty Glo, Pennsylvania: Without the Presence of an Engineer It is Perfectly Protected against Overload, Hot Bearings, or Overspeed

keeps steadily at work without the presence of any attendant. It is located two miles from the drift mouth and occupies a most substantial apartment. The walls are of heavy masonry with steel beams for ceiling. A 2,200-volt cable comes from the surface through a bore hole.

The substation is in many respects superhuman, for the motor-generator set is protected against overload, short circuit, hot bearings, reverse current, and overspeed to a degree that even the most efficient attendant could not approach.

If power is interrupted on the



Switchboard in Power Plant near Drift Mouth That Controls the Motor-Generator Set at Automatic Substation Located Two Miles Away

set acts as a booster. It takes off the peak loads and reduces the purchased-power consumption to a minimum.

In general it may be said that with automatic substations installed, it is entirely practicable and feasible to start and stop any number of generator sets with the aid of remote control either from the mine office or from any other convenient point. In the case of the station here in question, the starting and stopping of the set is simply effected by means of a push button located in the engine room of the power plant.

Indian settlement with a fort, established by Anthony Wayne, at the juncture of the St. Mary and St. Joseph rivers, down



This Map Shows Fort Wayne as an Indian Village and Frontier Fort

to the present time. Mr. Griswold recently delivered lectures, which were well attended, to the Chamber of Commerce, to joint assemblies, the city's business clubs, and gatherings of school children. The maps depict in detail the various steps in the city's growth.



Another Step in Its Development to a Thriving Industrial Community: In 1854 It Occupied a Considerable Territory South of the River

WALL-SIZE MAPS SHOW GROWTH OF CITY

An interesting and unusual method of visualizing the growth of a city has been worked out by B. I. Griswold, of Fort Wayne, Ind. A series of wall-high maps graphically demonstrate the growth of the city by contrasting various stages in its development from the days when it was a little



In 1921: Lectures, Graphically Illustrated in This Way, Proved Equally Interesting to the Chamber of Commerce, Civic Organizations, and School Children

Carl Frank, H. W. Williams
1920 Spy Run Ave. Fort Wayne, Ind.

Emil. Harry E. Schults
Park Ave.

Mess. Samuel
Osborn & Co. Ltd

266

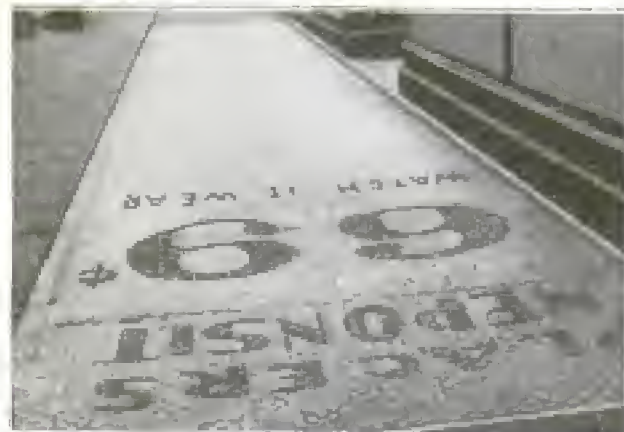
7658

POPULAR MECHANICS

Clyde Steel Works
Sheffield, England

NOVEL METHOD DEMONSTRATES QUALITY OF LINOLEUM

Advertising of a most convincing sort was recently adopted by a dealer in house furnishings who wished to demonstrate



Linoleum, Covering the Sidewalk in Front of a Store, was Given a Severe Test of Its Wearing Quality, Where All might See and be Convinced

the wearing qualities of his floor linoleum. On the sidewalk in front of his store, he laid a strip of the linoleum with the price per yard, and a request to the public to "watch it wear" printed on it. The way in which the sample stood the unusually hard wear and the constant exposure to the weather was an effective demonstration of quality.

EGG OPENER NEW SANITARY DEVICE FOR KITCHENS

Sanitary handling of eggs, in restaurants, hotels, and soda fountains, is made possible by a new egg-opening device. It consists of an enameled frame, in which a glass is placed. Over the glass is a cradle to hold the egg. By lowering a handle, a saddle strap is pressed down on the egg, forcing two fine points through



The Egg, Resting in the Cradle, is Pressed Down, as Shown at the Left. When the Handle is Raised, as at the Right, the Shell is Drawn Open

the shell. Lifting the handle draws the points apart, separating the shell into two pieces and allowing the contents to drop into the glass. All metal parts are made of an alloy which is not affected by the sulphur in the eggs.

7838

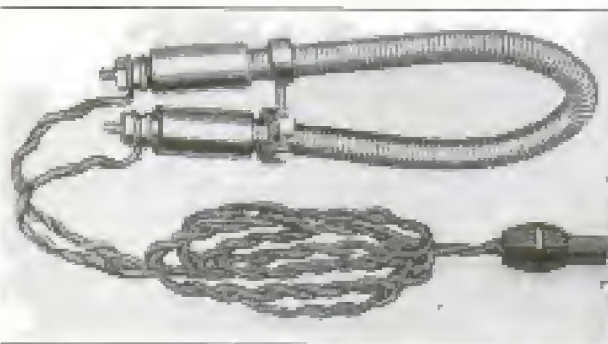
RUSTLESS PLASTIC STEEL NOW MADE IN ENGLAND

Steel that is both rustless and plastic has been produced at Sheffield, Eng. It has perfect rust-resisting properties, and can be stamped, punched, pressed, or engraved cold. When bent cold to a radius equal to its thickness, it shows no sign of fracture. It will retain a silver-bright polish in any atmosphere. Articles have been made of this steel that have the same strength as if made of brass or nickel, and only about half the weight.

7776

ELECTRIC MANIFOLD HEATER WARMS "COLD" ENGINES

An easily attached electric intake-manifold heater of recent development will be appreciated by those who have to crank a "cold" engine. The heater is connected to the storage battery by means of a socket mounted on the dashboard of the



The Manifold Heater, with the Cord and Plug Attachment for Connecting to the Storage-Battery Socket on the Dashboard

car, and is simply wrapped around the intake manifold, where it is operated for two to five minutes before the engine is started.

7551

ONE TIPPLE SERVES TWO MINES THROUGH LONG CONVEYOR

In Fayette County, West Virginia, where two coal mines, opening on opposite hills, are served by a single tipple in the valley below, a conveyor is used which is probably the longest of its kind in the world. One side is 1,070 ft. long and drops 458 ft., while the other is

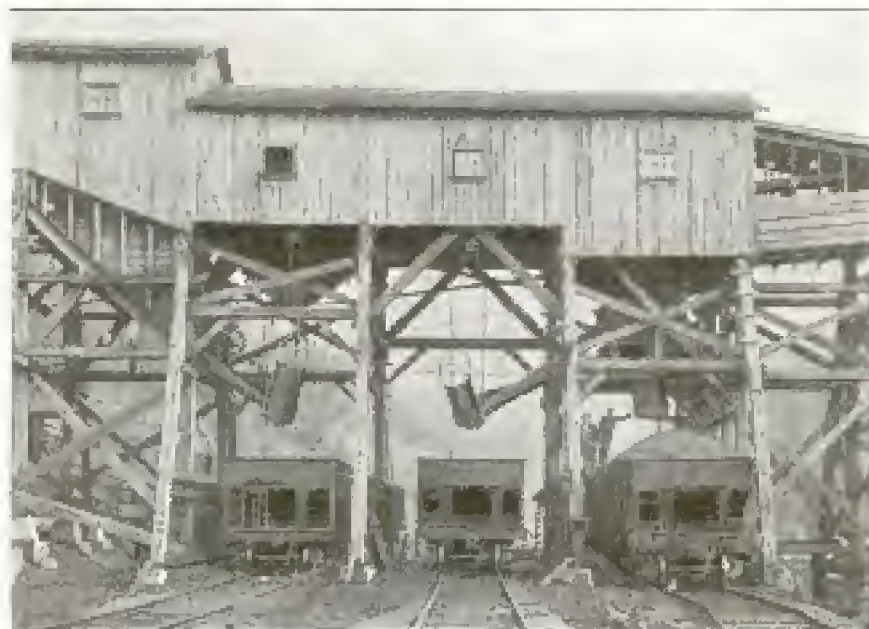


Long Conveyors Carry the Coal, from Mines on Opposite Hill-tops, to a Common Tipple, on a Railroad in the Valley Lying between the Hills

1,125 ft. long and drops 470 ft. The cable-and-button-type conveyor consists of a $1\frac{1}{4}$ -in. cable with 12-in. transversal iron disks bolted to it at 4-ft. intervals. The cable runs through a wooden trough, with a $\frac{1}{4}$ -in. steel bottom plate, the disks serving to carry the coal along. Steel prongs distribute the coal over the cables in such a way that the lumps rest on the slack. The friction of the slack keeps



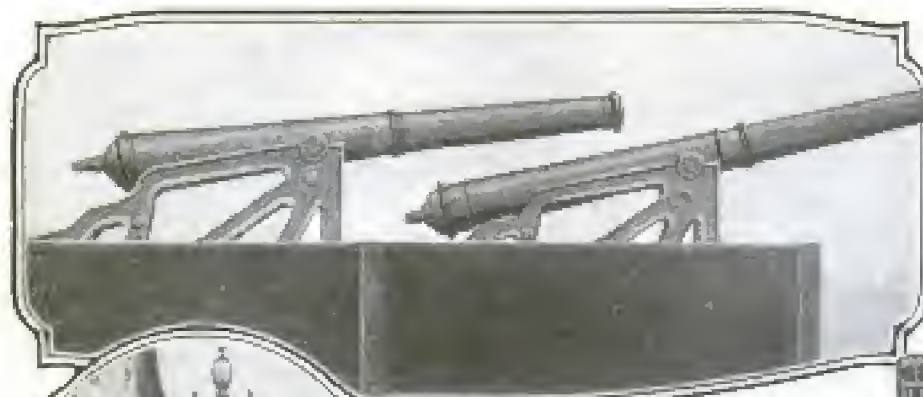
The Conveyor Trestles Consist of Towers and Trusses Built of Timbers Which were Shipped Ready-Cut and Numbered



The Tipple Where Coal from the Two Mines is Dumped into the Waiting Cars: Though One Tipple Serves Both Mines, Their Coal does Not Mingle

the conveyor from running away, and the lumps cannot grind the trough. A device connected with the driving gears acts as an automatic brake. The pull of the conveyor applies the brake if the belt breaks or the power fails, and prevents the danger of the conveyor, with its 50-ton load of coal, getting beyond control. Impurities, such as slate, are picked from the coal as it passes down the troughs, and are thrown into chutes emptying onto the hillsides.

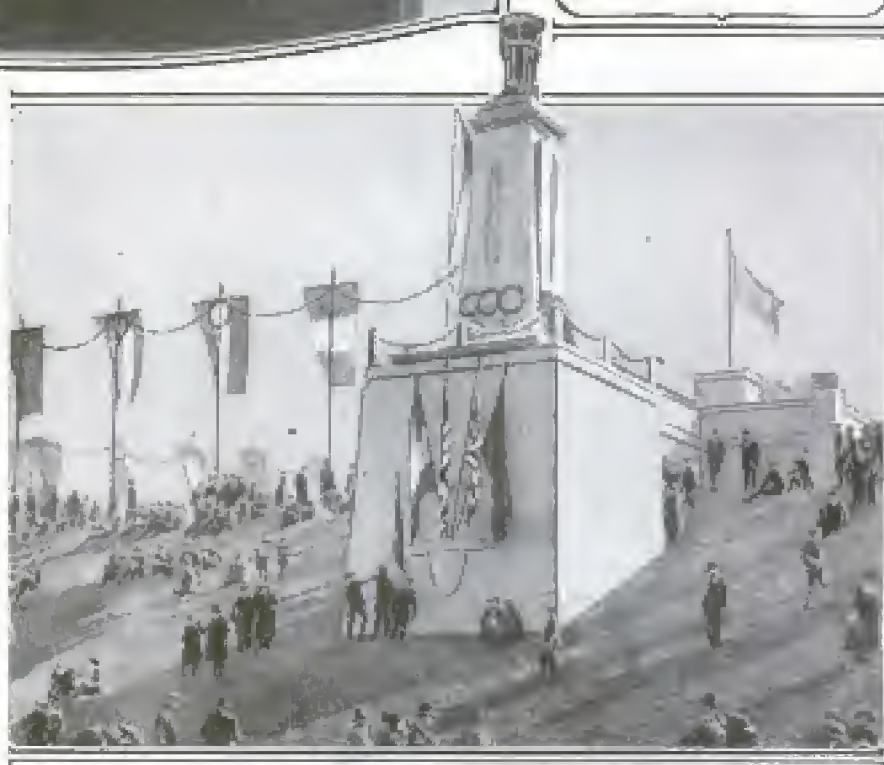
CIVIC FEATURES THAT PROMOTE THE COMFORT



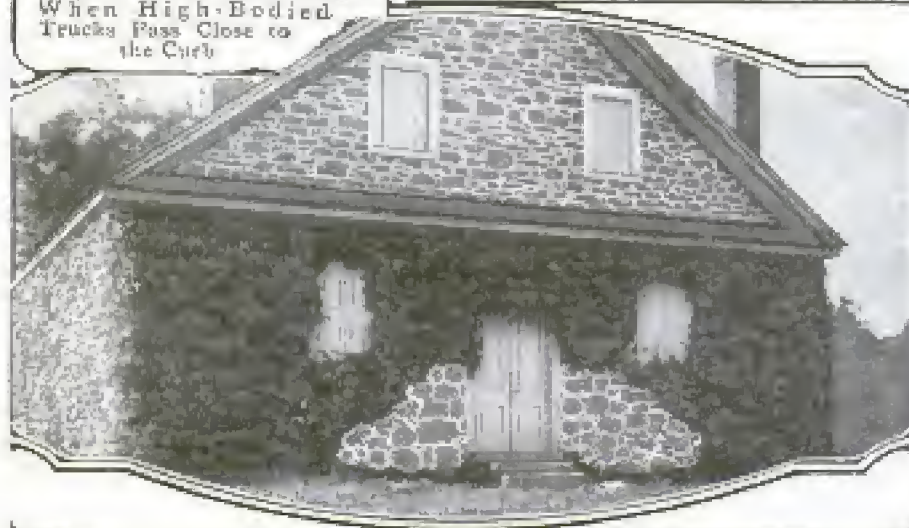
Two Sixteenth-Century Cannon, Similar to Those Mounted on the First Fort at Plymouth, Massachusetts, were Presented to the Town of Plymouth by the British Government, in Connection with the Tercentenary Celebration of the Landing of the Pilgrims, and were Placed at Plymouth Rock



Parking-Restriction Signs, Erected by the California State Automobile Association in the Downtown District of San Francisco, Have a Right-Angle Bend to Protect Them When High-Bodied Trucks Pass Close to the Curb



Dedication of the Kansas City, Missouri, War Memorial, during the 1921 American Legion Convention: In the Torch, at the Top, the "Flame of Inspiration" was Lighted, and Representatives of England, France, Belgium, Italy, and the United States Decorated It with Wreaths



This Picturesque Old Church, Built in 1769, Stands near Wellsville, Pennsylvania. In a Century and a Half, There have been Held in It Only about as Many Regular Services as Other Churches Have in a Year. Because It Is Not Easily Accessible, Services are Held Only on the Fourth Sunday of Each September



Trees Planted by the "Tree Club" of Ottawa, Illinois, Said to Be the First Organization Formed to Plant Soldiers' Memorial Trees, are Protected by Signs. A Bronze Tablet will be Placed on Each Tree, Bearing the Record of the Dead Soldier in Whose Honor It was Planted

AND ENJOYMENT OF VISITORS AND RESIDENTS

The trees around this boulevard were planted by the Civic Clubs of Salt Lake for its beautification. The Kiwanis Club will pay a \$25.00 reward for the arrest and conviction of anyone damaging them.

One of a Number of Signboards Placed along the Boulevards of Salt Lake City, Utah, by Civic Clubs, to Protect Trees, Which They have Planted along These Boulevards, against Vandals



Built in 1825, This "Old Log Courthouse," in Independence, Missouri, a Suburb of Kansas City, is Still Used. It has been Repaired Somewhat, but Still Shows the Bullet Scars of Indian Days



"King Fisher," a Hunting and Fishing Camp on the Cedar River in the Mountains near Seattle, Washington: It was Built, 26 Years Ago, by Harry Watson, a Seattle Sportsman, as a Place Where All Sportsmen would Be Welcome to Camp and Only be Expected to Leave the Place as They Found It

Street-Car Terminal at the Presidio, San Francisco: Beside the Platform and Shelter, There is a Building Containing a News Stand, Restaurant, Telephone Booths, and Shoe-Shining Stand

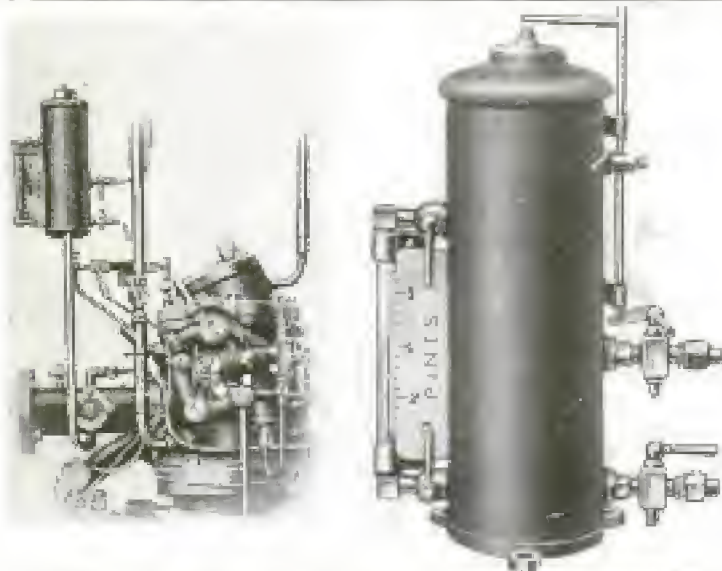


Cml. Maurice E. Pelgrims
 35 Place de la Esare
 270 POPULAR MECHANICS
 7123 Antwerp, Belgium

**FUEL-MEASURING TANK AIDS
 OIL-CONSUMPTION TESTS**

Tests of the fuel consumption of oil and gasoline engines may be made quickly,

and at any time, by the use of an automatic fuel-measuring tank being manufactured in England. This tank is fixed in the fuel-supply line, well above the level of the carburetor or fuel-injection pump, preferably near the main fuel tank and below it. A float-operated valve, at the top, allows the escape and entrance of air when the tank is filling or the engine is running, and also controls, automatically and accurately, the amount of fuel admitted. Fuel enters the tank from the supply pipe through a cock and passes out to the engine through another cock. Both cocks are always open except when making a test. To make a test, the cock at the supply pipe is closed, and at the end of a fixed time the cock to the engine is also closed. The consumption can then be read on the scale opposite the oil level in the glass gauge. This scale is calibrated in pints.



Left: The Fuel-Measuring Tank, as It Appears Mounted in the Engine-Supply Line, Above the Level of the Carburetor.
 Right: The Tank Enlarged to Show Its Construction

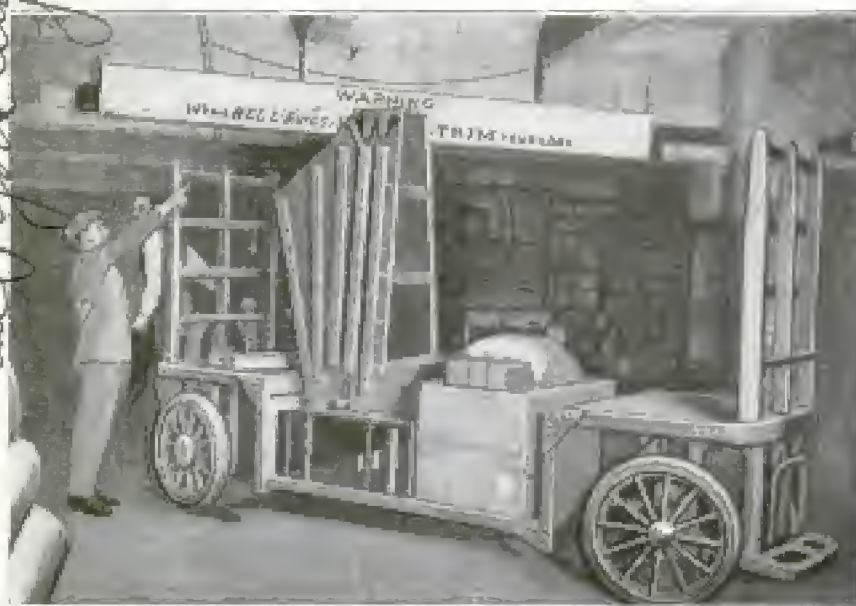
**BELL WARNS TRUCKS LOADED
 TOO HIGH TO PASS DOOR**

To warn drivers when their trucks are loaded too high to pass through the doorways of express terminals, boards are being hung from the ceiling, at the height of the entrance. A load that is too high, strikes the board and rings a small warning bell. This device is also used in front of eleva-

tor shafts, and is said to prevent many accidents to persons and much damage to shipments.

**MAMMOTH PUMP HAS CAPACITY
 OF 40,000,000 GALLONS**

An addition was recently installed at the Louisville, Ky., waterworks, consisting of a mammoth pumping engine, the capacity of which is 40,000,000 gal. every 24 hours. This vast amount of water is rather beyond comprehension, but may be found easier of conception by remembering that the average daily consumption of water per person in Louisville, is estimated at 107 gal. Not all the water pumped is delivered through the mains for consumption, as approximately 20 per cent is used for washing the various filters. Thus out of the total amount pumped, only about 32,000,000 gal. would be delivered, which, however, is enough to supply a population of 299,065 at that rate.



This Load Is Too High to Pass through the Doorway, but a Warning is Given by a Bell When the Load Strikes the Board in Front of the Door, So That the Truck may be Stopped and the Load Properly Adjusted to Avoid Any Possible Damage to It

Louisville Water Co.
 Louisville, Ohio

American Railway Express
 New York City



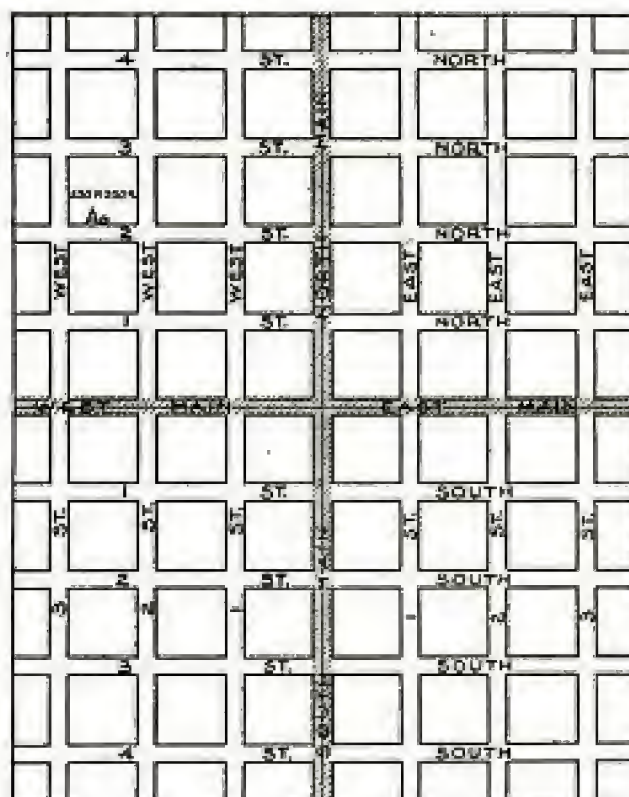
LIFEBOAT-RELEASING GEAR ACTS AS SAFETY DEVICE

Safety devices for the release of lifeboats when lowered from a ship's davits have taken many forms. One that looks simpler than most has been recently invented. A pipe supported along the bottom of the boat just above the keel has at each end a small crank that operates a vertically disposed rod on the end of which is a roller that locks the hook at each end of the boat by engaging its shank. The hook is pivoted on a support connected to the boat in such a manner that when the shank is left free, the hook is automatically overturned, releasing the boat from the davit falls. The unlocking is done by giving the pipe a half turn with a lever that is connected to it at any convenient point at the bottom of the boat. 7027

SIMPLE LOCATION SYSTEM FOR CITY STREETS

Application has been made for a patent upon a system of locating streets, residences, and other points in cities, which is similar to the method of locating points by latitude and longitude. The city is quartered by two main division streets. All enumerations begin at these division streets, 100 numbers being allowed to each block, and even numbers are used on the right side of the street, odd numbers on the left. To locate any building, its street number is given first, followed by a letter indicating its direction from the division street. This is followed by a number and letter indicating the distance

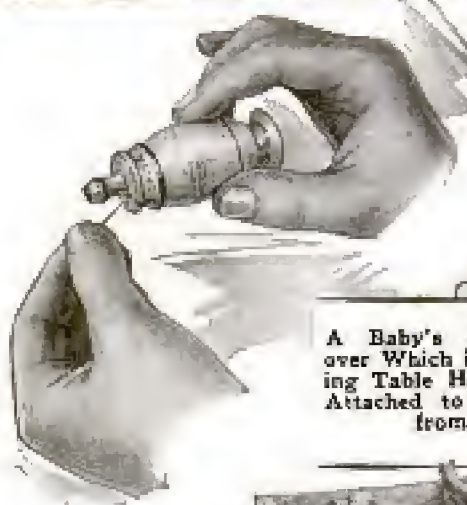
and direction, from the division street, of the street on which the building is situated. Supposing that a person inquires for the location of some building, and is told that it is at 1225 E. 400 S., he knows immediately that it is in the southeast quarter of the city, $12\frac{1}{4}$ blocks east of the division street running north and south, and on the left side of a street four blocks south of the division street running east and west.



A in the Plat is Indicated by 250 W. 200 N. in Other Words, It Is Two and One-Half Blocks West of North Main Street and Two Blocks North of West Main Street

cl no. J. W. Carlson.
1375 1900
Salt Lake City, Utah

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



This Needle Case Holds Five Different Sizes. The Top is Turned to the Desired Size and the Needle Drops Out of a Small Hole

This Sewing Pin is Used by Fastening the Long End at the Sewer's Knee and Allowing the Projecting Short End to Hold the Material being Hemmed

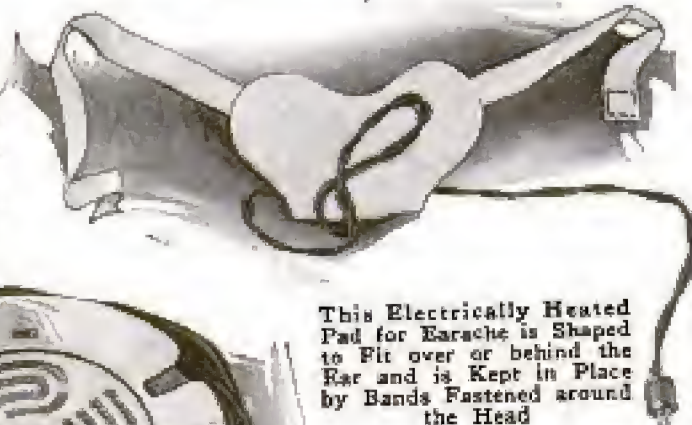
A Baby's Collapsible Bathtub over Which is Adjusted a Dressing Table Having a Safety Belt Attached to Prevent the Child from Rolling Off



A Garment for Car Owners Which can be Put On or Taken Off in Four Seconds without being Pulled over Dirty Shoes: It is Held in Place by Flexible Steel Bands



A Medical Thermometer Which does Not Require the Usual Vigorous Shaking: Slight Pressure on the Top Brings the Mercury Down in One Second



This Electrically Heated Pad for Earache is Shaped to Fit over or behind the Ear and is Kept in Place by Bands Fastened around the Head



A Combined Vanity and Watch Case with Silver Mesh Chain Has Coin and Powder Holders, Card Clip, and Writing Pad

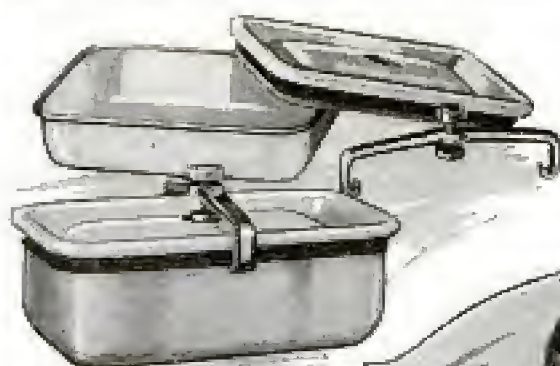


An Electric Hot Plate Which can be Used As a Toaster, or As a Heating Element for the Various Professions

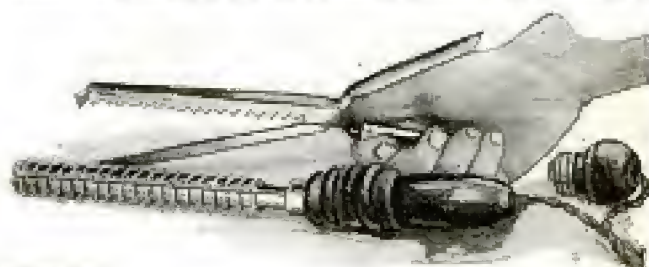


This Snap Fastener can be Attached to Any Material without Sewing. The Screw Point Pierces the Goods and the Other Half Fastens on It. The Combined Parts Then Snap Together

INTENDED FOR THE HOME AND ITS MEMBERS



This Container Is Valuable for Storing Food or Liquids of All Kinds, Because It Is Water and Air-Tight, and Is Especially Useful in Hospitals for Holding Sterilized Instruments or Gauze



For Marcelling the Hair, the Lower Instrument is Electrically Heated and Thrust into the Hair. The Upper Instrument is Then Tightly Squeezed over the Hair Surrounding the Heated Part



A Telephone-Slug Holder, with Which the Subscriber Always Has the Necessary Means Handy to Operate the Telephone in Case of Emergency Instead of Frantically Searching for a Nickel



A Rubber Boot without a Heel, So That It can be Worn by School Children over Their Shoes in Snow or Slushy Weather: The Boot Folds into a Small Container When Not in Use



With the Use of This Necktie Press the Wrinkles can be Taken Out of the Necktie Overnight



This Is a Highly Ornamental Table with a White-Porcelain Top Which can be Folded Out of the Way When Not in Use, Thus Saving Space in Modern Kitchens



Flexible Cuff Links will be Appreciated by Those Having Occasion to Do Dirty Work While Wearing Clean Cuffs. Instead of Soiling Clean Linen in Removing the Ordinary Link to Push Up the Sleeve, the Flexible Link Yields without being Unfastened

LADDER FOR FIGHTING CHIMNEY FIRES DEvised BY FIREMEN

A light, easily handled ladder for fighting roof and chimney fires has been devised by members of the Brunswick, Me.,

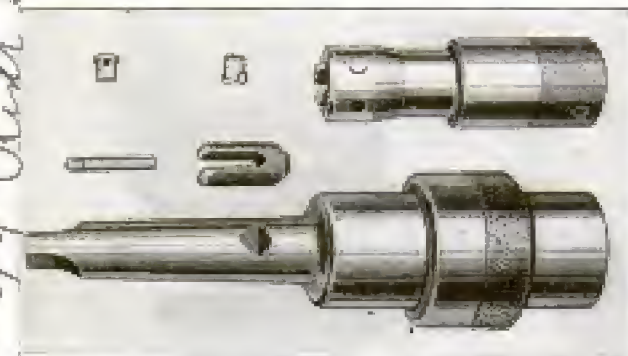


fire department and is attracting much attention among firemen in New England. It consists of two wooden, 2 by 3-in. side-pieces, with rungs of heavy strap iron and strong spikes at the lower ends. The rungs are fastened with a single bolt at

each end so that the ladder may be collapsed when not in use. It can be carried anywhere by one man, and the spikes, biting into the roof, hold it firmly in place.

SOFT SHEARING PIN IS USED IN QUICK-CHANGE CHUCK

Combining a soft shearing pin with a quick-change chuck is an innovation that will be noted with great interest by those who have occasion to use a drill press of any kind. The chuck is made to hold ordinary drills with tapered shanks, and has a safety arrangement which prevents the breaking, or "burning," of drills, taps, reamers, counterbores, etc. The safety



Top: Two Views of Ejector and Collet. Center: The Soft Shearing Pin and Jaws. Bottom: The Assembled Quick-Change Chuck

method lies in the insertion of a soft-steel pin into the jaws of the chuck, where it is held in place by a setscrew. In the event of the drill, or other tool, being overstrained, which would break, or burn

it, the soft pin is sheared off, thus saving the tool from injury. By loosening the setscrew, the sheared pin can be removed, and a new one inserted.

7733

SEA-WATER ICE IS USED FOR PACKING FISH

An innovation in the fish industry of France is the making of ice from sea water, by a process which eliminates the concentration of salt, that usually occurs when brine or salt water freezes. This "salt ice" performs the double service of keeping the fish cold, and also of "salting down" the fish as a means of preserving them. In recent experiments conducted with this ice, it has proved far superior to the ordinary fresh-water ice, both in cooling and in preserving qualities.

7702

"STEPPING ON THE GAS" AIDED BY USE OF AIR CYLINDER

An air cylinder attached to a pedal placed over the accelerator is a new automobile accessory now being manu-



factured in the East. It is claimed that the appliance eliminates any "fluttering" of the throttle caused by driving over rough roads or shifting of

gears. In this manner the even running of the motor is assured.

EMPLOYEES CONTEST TO BOOST PLANT-SAFETY INSPECTORS

Employees of a large manufacturing concern, with several plants, have reduced accidents to a remarkably low figure in their effort to raise their own plant-safety inspectors above others on the company's monthly chart. This chart shows a comparison of hours lost, due to accidents, with total hours worked in each plant, by columns of varying height. The smaller the percentage of loss, the higher is the column. In each column are printed the name of the plant, percentage of loss, number of hours lost, and number of accidents for the year and month.

B. C. Christy
S. W. Mill
Clearing

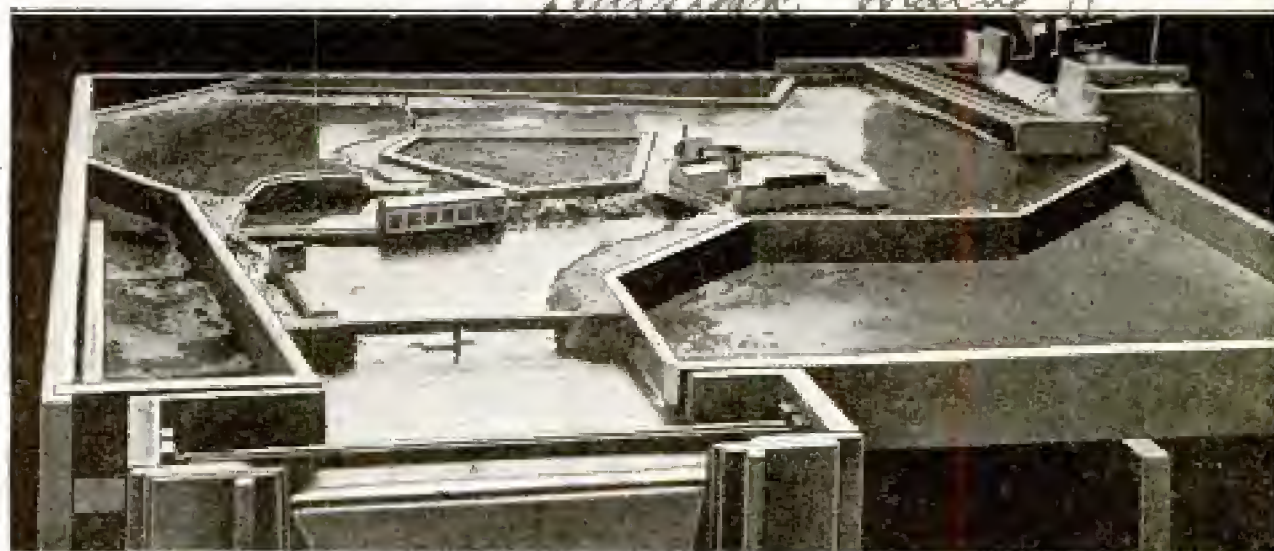
Wade-American Tool Co. Waltham, Mass.
7641
Dear Sir:

packing sea water
ice

MODEL BUILT TO STUDY WATER-POWER PROBLEMS

By SAM E. CONNER

*31 Orange St.
Leicester, Maine*



Model of a River and Contemplated Power Plant Made to Exact Measurements from Careful Surveys So That It Was an Identical Miniature Duplicate of the Originals: Tests were Conducted by Allowing Water to Flow through the River of the Model under Conditions Found in the Real River

ENGINEERS called upon to install a hydroelectric power plant on the Kennebec River, Me., in the town of Skowhegan, found themselves confronted with a serious problem. The place where the plant and dams must be located, was in the center of the town, with valuable property all around it. It was necessary, in order that the power desired be obtained, to change the existing water head from a range of 12 to 18 ft. to a constant head of 32 ft., and at the same time the dams must be so constructed that, besides caring for a normal flow of 3,600 cu. ft. per second with the 32-ft. head, they would handle, with equal facility, a flood-time flow of 150,000 cu. ft. per second to protect the surrounding property from damage by freshets on the river.

To add to the difficulties of the engineers, the falls, at the point where the power plant was to be built, were divided by a large island in such a way that the falls of the river's south channel were nearly 1,000 ft. farther down the river than those of the north channel, which were of horseshoe shape.

In order that they might be certain of their plans, the engineers made a model of the river bottom, banks, dams, power station, and other buildings in close proximity to the place. This was made to exact measurements from careful surveys, so that it was an absolute duplicate of the river and power plant in miniature. It was then tested by permitting water to flow through the river of the model under conditions as nearly like those which were to be met at various times on the real waterway, as could be pro-

vided. These results were such that the engineers felt they were right, but determined upon a further test which they thought would be a final stamp of approval.

Old rivermen, who had driven logs on the Kennebec and over these falls countless times, were called in. Miniature logs—also made to scale—were floated through the model. Each time before the logs were started on the river, the rivermen were asked to designate the starting point and to tell what, on the main river, in actual work, the logs ought to do. They were also asked into what eddies they should float, and how they should strike the sluices. Acting upon the rivermen's information, it was found that the miniature logs traveled exactly where predicted in every instance, thus demonstrating the accuracy with which the model was built, and also the correctness of the plan for the installation.

The power plant will have a present installation of three 3,000-hp. units, with provision made for a fourth, and will be located upon the south fall. As the bulk of flood water must be handled at the north dam it was necessary to provide exceptional facilities for letting through the freshet pitch. This has been accomplished by flashboards, hinged to the top of the middle section of the dam, each one being $7\frac{1}{2}$ ft. high. These are operated by men sent out in a basket on a cable over the dam. When the boards are lifted, a toggle joint on the downstream side falls into place, securely fastening the boards. To release them the men reach down upon the upstream

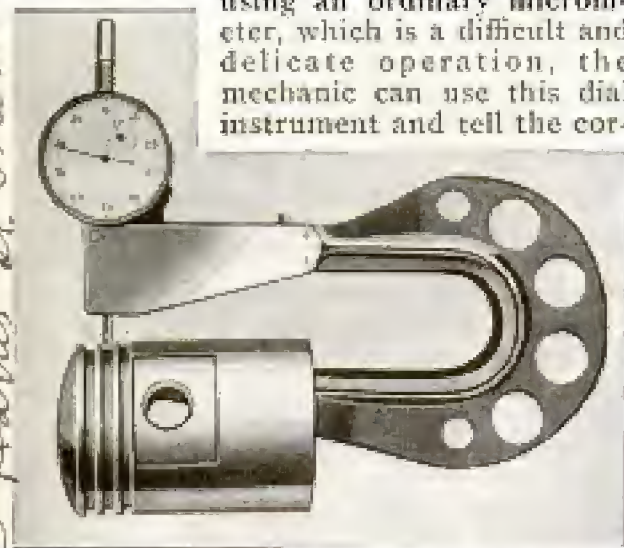
side with a hook, catch the trigger which releases the joint, and the board falls. The north section of this dam is equipped with flashboards, 11 ft. high, of the raising and lowering type, while at the south end

have been installed two radial 32 by 17-ft. gates, having a capacity to discharge 7,500 cu. ft. of water per second. This north dam is 475 ft. in length and built of solid concrete reinforced with steel.

7630

DIAL MICROMETERS ARE USED TO MEASURE PISTON GROOVES

The depth of piston-ring grooves can be rapidly measured with a new dial micrometer. Instead of the old way of using an ordinary micrometer, which is a difficult and delicate operation, the mechanic can use this dial instrument and tell the cor-



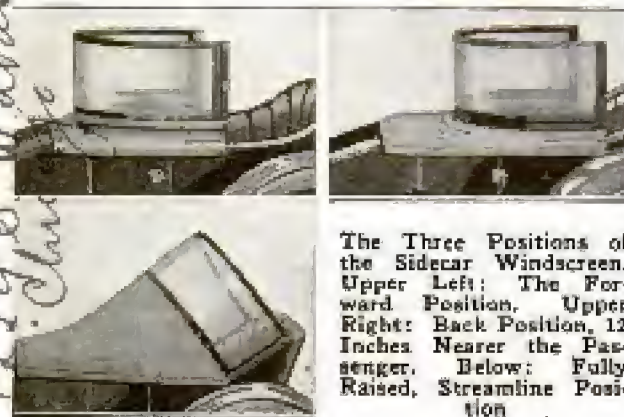
With the Handle, Seen Above the Dial, the Point is Raised or Lowered and the Depth of the Piston-Ring Groove is Indicated by the Dial

rect thickness at first glance. The dial has two hands on it, one large and one small. The small hand is used solely to record the number of revolutions made by the large hand, so that the total is quickly seen.

7640

STREAMLINE WINDSCREEN MADE FOR MOTORCYCLE SIDECARS

A windscreen for motorcycle sidecars, which has been used with great satisfaction in England for some time, has just made its appearance in this country.



The Three Positions of the Sidecar Windscreen. Upper Left: The Forward Position. Upper Right: Back Position, 12 Inches Nearer the Passenger. Below: Fully Raised, Streamline Position

A flexible, transparent panel is mounted in a steel frame. To the bottom of the frame is attached a waterproof twill apron. This screen is adjustable by means of wingnuts. When fully raised, it deflects all air, rain, or snow over the head of the passenger, giving absolute protection, and decreases the air resistance of the car.

7749

SPECIAL BUREAU ESTABLISHED IN MINNEAPOLIS POST OFFICE

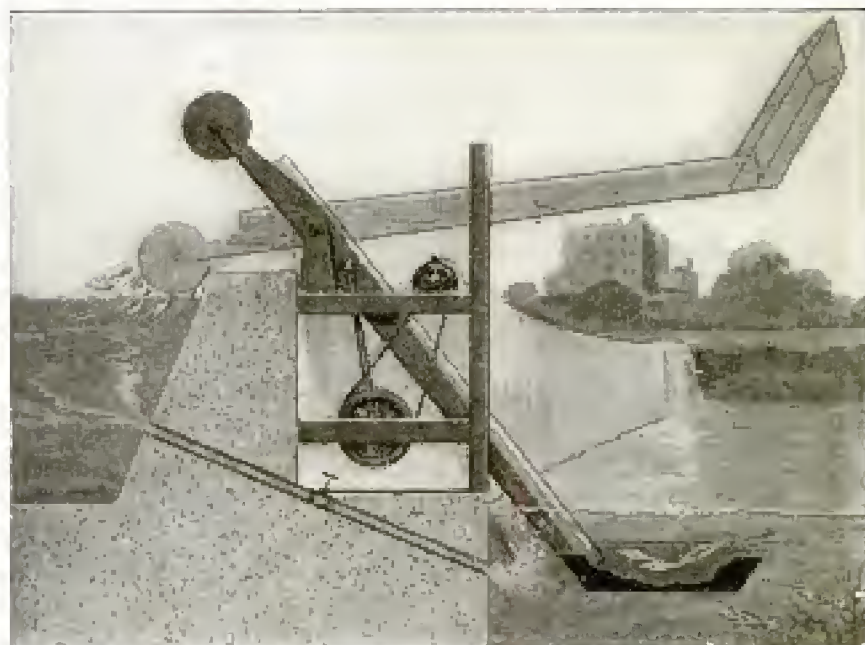
In the post office at Minneapolis, Minn., there is a special bureau which is the novel and highly successful attempt of Postmaster Purdy to assist foreigners. Many foreigners, who could not speak English, and were accustomed to going to government offices for everything in their native countries, applied for help in reading or writing addresses, making customs declarations, and filling out all sorts of papers, and also made use of the money-order and postal-savings services. An "Information Bureau" was established, "information" being one of the first English words a foreigner learns to recognize. A survey was made of the 1,155 employees in the post office to learn what foreign languages each could speak or read. Whenever a foreigner applies for service, an interpreter is called from the staff. Every dialect of Europe is represented in the post office, and the only languages employees have failed to interpret are Chinese and Japanese. Besides assisting foreigners, the Information Bureau is called upon to answer all kinds of questions, especially by automobile tourists. It keeps on hand road maps, time tables, lists of resorts, and many other kinds of information. Because of his success with this bureau and other innovations, Postmaster Purdy was summoned to Washington by Postmaster-General Hays, to tell him and other postmasters how to do it.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.

**NOVEL FORM OF ELEVATOR
 LIFTS FISH OVER A DAM**

A dam in a river is often an obstacle that prevents fish from going up the river to spawn. Where it is desirable that the fish should spawn in the part of the river above the dam, a means has been devised by a fisherman of Massachusetts for lifting the fish over this obstacle. The contrivance is in the nature of an elevator in the form of a counterbalanced beam that is pivoted on trunnions rotating in supports at the top of the dam, and extends downward from this pivot far enough to reach the water below the dam, the end of the beam above the pivot extending to a convenient length for the attachment of a counterweight. To the end at the lower water level is connected a metal scoop, large enough to hold several fish. From this scoop, along the whole length of the upper surface of the beam, there is an outlet pipe, so that when the scoop is raised a little above the horizontal by swinging the beam on its pivot, the water and the fish in the scoop

run down the pipe and are discharged into the river above the dam. The elevator is operated by a system of gears driven by an electric motor. The fish are attracted to the vicinity of the scoop by a disturbance of the water caused by the discharge from



Elevator for Lifting Fish over a Dam When Going Upstream to Spawn: Elevator is Shown, Dark, Catching the Fish in Its Scoop, and, Light, in Its Raised Position Discharging the Fish into the River above the Dam

a water pipe that penetrates the dam. It is expected that this means of helping fish over a dam during the spawning season will be found superior to the customary fishway or ladder. It has the added advantage of wasting no water.

7447
**TWO-SHELL GARBAGE CAN
 DISINFECTS REFUSE**



Anything leaking from an ordinary garbage can spreads on the ground, and becomes a breeding place for flies and a culture bed for bacteria. This defect is remedied by a two-shell container that is now being made in Kentucky. The inner shell is the garbage can, and the outer one catches any leakage there may be, and contains a germicide.

5808
**SMOKESTACK WRECKED BY NEW
 METHOD IN 55 MINUTES**

Five workmen recently brought a 148-ft. smokestack to the ground in 55 minutes, by a new method. This stack, on Staten Island, N. Y., measured 47 ft. in diameter at the base and weighed 350 tons. Three openings were made at the base, and wooden blocks, 4 ft. high and 4 in. in diameter, were inserted as shorings. A gap, 4 ft. high, was then made in more than half of the circumference by removing the bricks. Two of the shoring blocks were removed and the center block, soaked with kerosene, was burned out. The stack crashed with such force that some of the bricks were buried 2 ft. in the ground, but most of them remained intact and can be used again.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

Hagan Lead Engine & Mfg. Co. Winchester, Ky.

*Conl. Germania & Bremen, 48
 48 Cont. H. Everett, 48
 Mass*

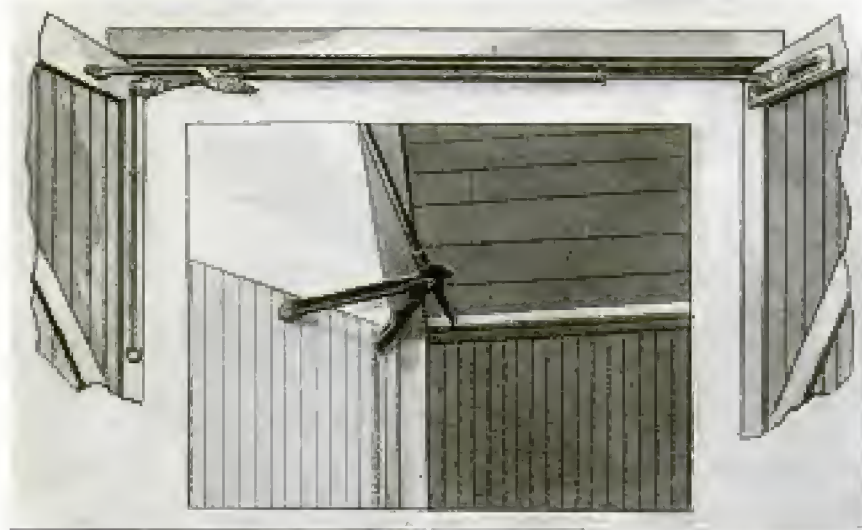
*new York Times 11/24/21
 P. 8*

Lindberg Double Swing Door Control Co
 939 S. Olive St. Los Angeles
 POPULAR MECHANICS
 Calif.

278
 6268

DOUBLE SWING DOORS LOCKED IN ANY OPEN POSITION

While entering or leaving a garage, one of the swing doors is likely to be blown to a partly closed position, often damaging a car while passing it. To make this impossible, a control has been devised that securely locks the doors in any open position. It consists of a pair of rods in connection with two brackets, each of which is fastened to the top of one of the doors. At one end of the rods is a toggle arrangement with two arms, one of which has a segmental end perforated with holes by means of which the toggle can be adjusted to hold the doors locked at any desired angle of opening. A pull on a chain releases the toggle so that the door can be closed and locked again.



Above: Outside View of Garage Doors Open and in Locked Position; by Pulling the Chain on the Left-Hand Door the Lock is Released and the Doors can be Closed. Inset: View from Inside of Garage Looking Up at the Locking Toggle

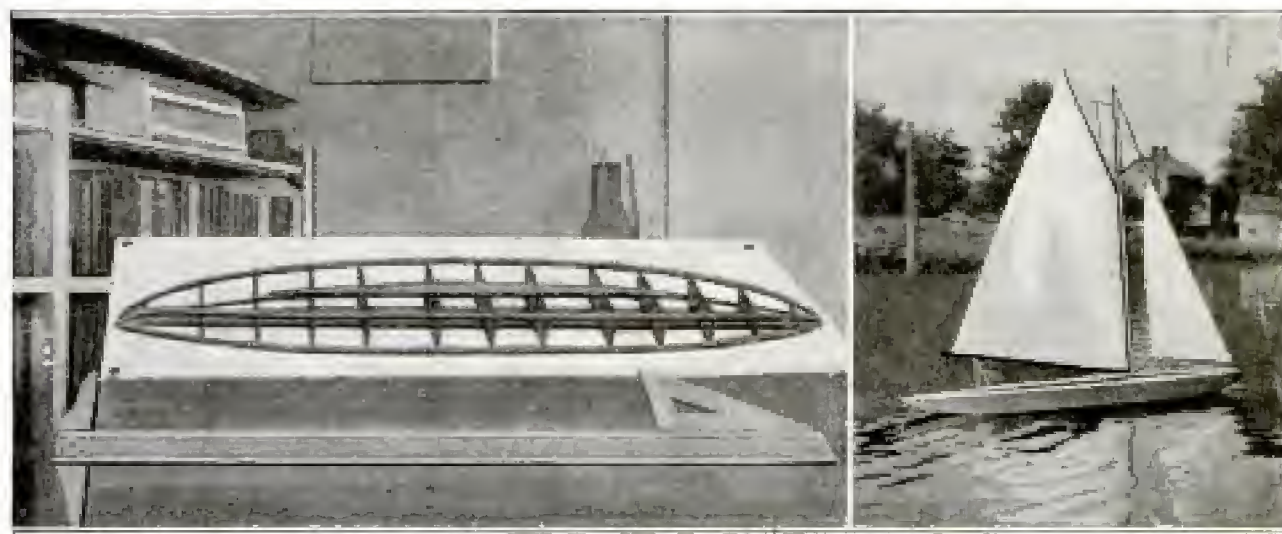
7476



PHOTO BY S. L. LAND SERVICE

FARMING FISH IS ODD OCCUPATION OF SOUTH SEA ISLANDERS

ALTHOUGH the word farming is usually associated with the cultivating of land and the sowing of grain, the South Sea Islanders have a method which is quite different. Instead of planting grain and harvesting crops, they catch fish and place them in inclosed bodies of water, to be harvested at the owner's pleasure. The fish are obtained from shallow lagoons, caused by the formation of coral walls, which surround these islands, and are left in the "farms" until an opportunity offers to sell or barter them for other necessities.



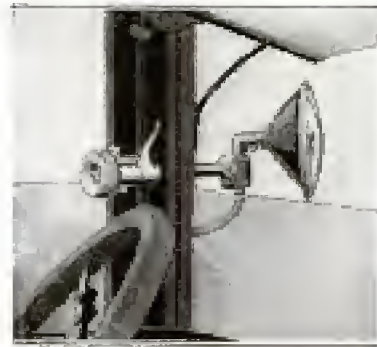
Left: Framework of Boat Made Entirely of Strips of Heavy Paper and Shellac Held Together with Glue, Shown on an Ordinary Drawing Board. It is the Same Length as the 42-Inch T-Square beneath It. Right: The Paper Boat Finished and Rigged, Seen in Full Sail on the Water

**HULL OF SAILING-BOAT MODEL
MADE ENTIRELY OF PAPER**

More different kinds of material can be used in connection with boat building than in almost any other form of structure. Boats have been built of every kind of wood, of every kind of metal, of stone and of concrete, and even of paper. A model of such a boat has a hull 42 in. long, 6 in. wide, and with a draft of 7 in., made entirely of paper and shellac, finished with several coats of oil paint and spar varnish. Frame, sheathing, deck, and keel are all made up from paper held together with glue, and the only metal used was 1½ lb. of lead required for ballast. It is a sailing boat, with the spars of pine. Its total weight is 2 lb. 13¼ oz. The boat is now nearly three years old, and though it has been sailed a great deal, it is just as good as new.

**AUTO SPOTLIGHT AND CONTROL
FOR CLOSED OR OPEN CARS**

Though specially designed for use on closed cars a new spotlight and control is



equally suitable for any style of automobile. On open cars it is attached to the windshield by means of a bracket. To install it on a closed car, a ¾-in. hole is bored through

the corner post of the car, and the control housing is passed through this hole. A

knob on the control handle, inside the car, is turned to move the lamp to the right or left horizontally. When a release key is pressed, turning the knob moves the lamp with a circular motion, throwing the light in any direction desired. The lamp may be locked in any position.

**TRAFFIC DIRECTOR CANNOT
BE DAMAGED BY ACCIDENTS**

A new traffic director is made of a one-piece metal casting and is practically indestructible, besides having other characteristics that recommend it. It is 22 in. high, 18 in. wide, and weighs 250 lb. When placed in the street, it leaves a clearance of 12 in. to the street-car tracks on each side. It is so made that it is self-righting when tipped over, will not spin if struck a glancing blow, and cannot be moved far if hit directly. It is not affected by weather.



Plans have been made for extensions of many of the existing subways in London, Eng., for the linking up of others, and for enlarging the oldest one sufficiently to accommodate the present subway rolling stock. This enterprise involves new capital to the amount of 30 to 40 million dollars.

Little Giant Co., Manufacturers, Birmingham

Thompson Info Co.
4th + St. Clair St. Dayton, Ohio
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CHILDREN'S PICTURE-STORY DEPARTMENT



When Doctor George J. Fisher, Deputy Chief Scout Executive, Visited the Boy Scouts of San Diego, California, He Found This Novel Headquarters, an Indian Village Which was Saved from the Panama-California Exposition and Presented to the Scouts by the City. This Push-Ball Game Was Part of the Program Given for Doctor Fisher

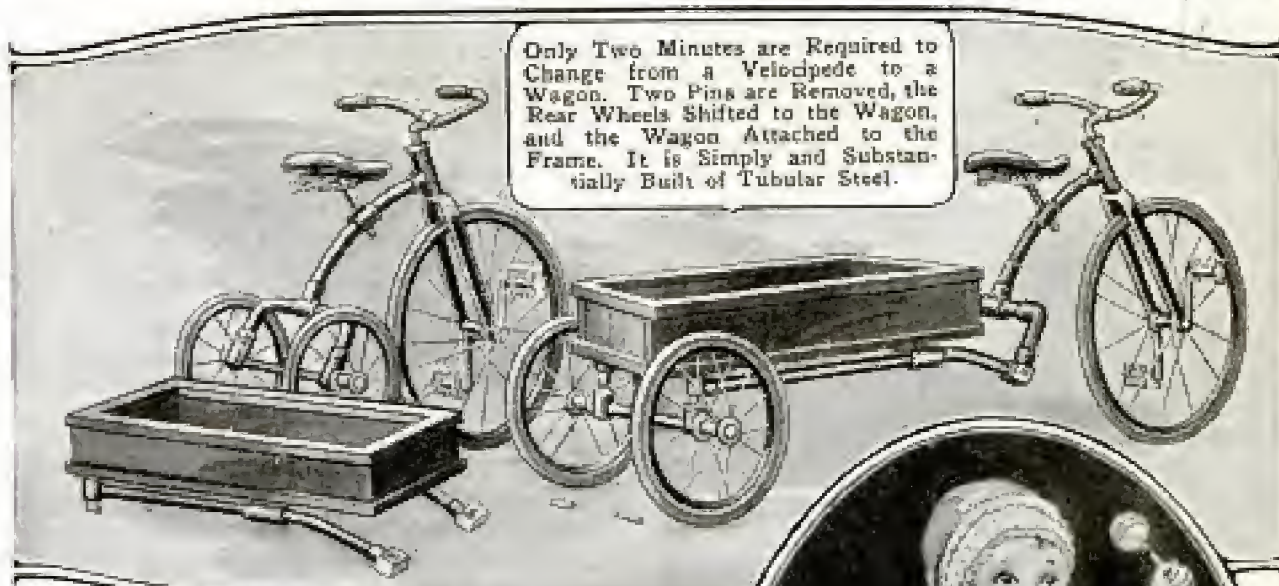


A Kiddie Car with a Sidecar: There Is Always Something New to Please the Children, and the Most Popular Toys Are Those That Are "Just Like Big Folks Have." With This Outfit the Youngster can Take His Favorite Doll, Woolly Dog, or Other Pet, for Company When He Goes Riding



When Andrew J. Abell, Jr., Left San Francisco on Horseback He Had Four Companions, but He Was the Only One to Reach Washington, District of Columbia, after a 5,926-Mile Ride. His Dog, "Trix," Rode Back of the Saddle, and Was Probably the First Dog to Make Such a Trip and to Meet the Governors of 29 States. Young Abell, Who Is 18 Years Old, Obtained the Autographs of All the Governors along His Route

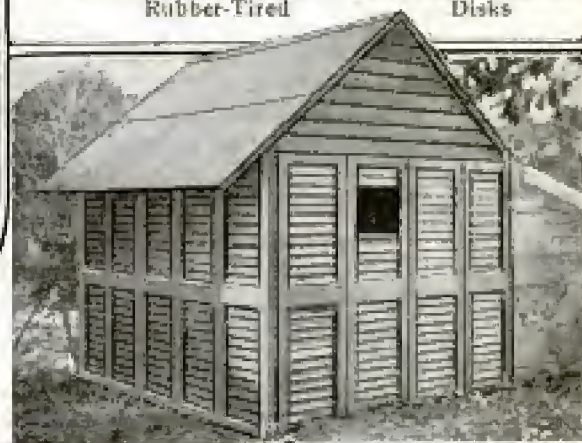
Convertible Bicycle Wagon - The Coleman Co 2765 OF MODERN ACTIVITIES AND INTERESTS Clyric Ohio



A Padded Iron Ring Surrounds and Supports the Child, and the Front Props Keep the Vehicle from Tipping Over. The Straddle Seat Is Just High Enough to Allow Baby's Feet to Touch the Floor, and He Learns to Walk in a Natural Way. The Rear Wheels Are Specially Designed Rubber-Tired Disks



Here Is a New Sort of "Pep" Testing Machine, Invented by a Physical-Culture Expert of Boston, Massachusetts. The Person to be Tested Stands under the Suspended Platform and Jumps Straight Up into the Air, Pushing the Platform Up. At It Moves, It Registers the Height of the Jump

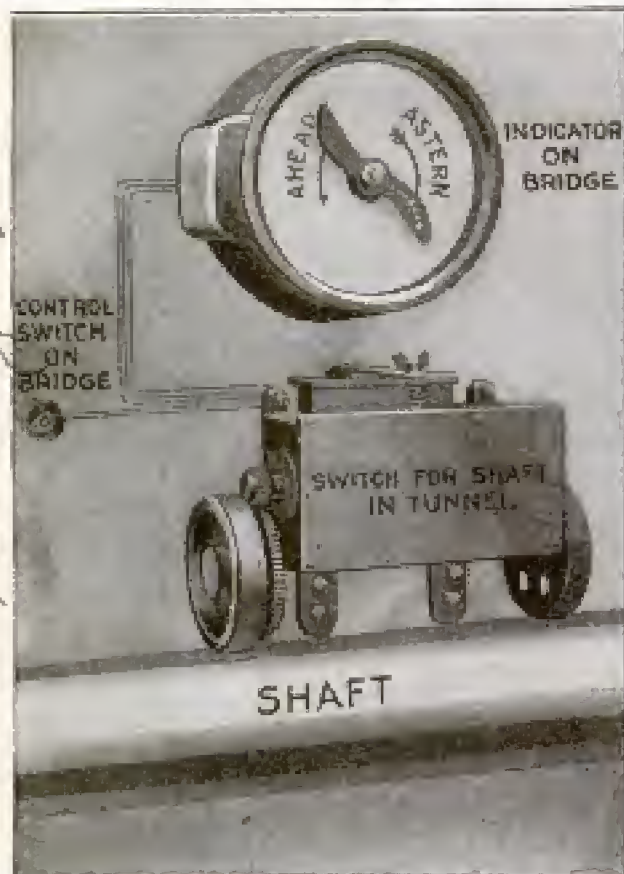


This Six by Eight-Foot Library, Built Almost Entirely of Old-Fashioned Green Shutters, Is the Business Undertaking of Two Schoolboys, in the Suburbs of Kalamazoo, Michigan. They Started a Year Ago with 50 Books and Now Have About a Thousand, Which They Lend for One Cent Each

Mr. Dudley Sargent

ENGINE DIRECTION IS SHOWN BY AUTOMATIC TELLTALE

Telltales for giving the direction of engines, are necessary aids on a ship, and the installation of these appliances usually



The Ahead and Astern Indicator Electrically Connected to the Inclosed Switches, Which are Controlled by the Wheels Resting on the Shaft

proves to be quite expensive, especially if the ship is driven by high-speed turbines. With turbines, costly reduction gears have to be placed on the driveshaft, and these gears require close attention if they are to function properly.

As a relief from this combined problem of expense and maintenance, an automatic electric telltale has been brought out by a firm in Glasgow, Scotland. The new instrument has two selector switches placed at the driveshaft, which are controlled by two small wheels, turned by the shaft. The wheels are arranged so that one will close a switch when the shaft revolves in the "ahead" direction, and the other will close a switch when the shaft revolves in the "reverse" direction. The switches, in turn, control a distant electric motor and two electromagnets. The magnets represent the two respective wheels on the driveshaft, and are operated when the selector switches are closed. An indicator, having driving gears for "ahead" and

"reverse," is thrown into gear by either magnet, as the case may be, and the motor revolves the indicator in the same direction as the ship's propeller. Any number of these telltale stations may be located about the ship, all dependent on the one set of selector switches, and the electric current required can be obtained from the lighting circuit, or from batteries.

7821

BEAUTY WILL BE RESTORED TO MINNEHAHA FALLS

Restoration of the beauty of Minnehaha Falls, famed in Indian lore and in Longfellow's poems, is a project recently undertaken. The water feeding the falls has diminished during the past 10 years, until this beauty spot possesses only remnants of its former grandeur. A reservoir is planned at Rice Lake, which would empty into Minnehaha Creek and thence over the falls.

7687

STEEL CHIP 166 FEET LONG TURNED OUT ON LATHE

What was probably the longest steel chip on record, measuring 166 ft., was turned out not long ago on a 30-in. lathe, operating on a machine-steel forging for turbine-shaft sleeves. The unusual length of this chip was credited to the clever workmanship of the operator in handling the lathe, to good tools, and the high quality of the material.



Steel Chips, Curling off Lathe Work, Are a Common Sight, but Few Approach the Length of This One, Which Probably Holds the Record

and John Beatty, 1010 W. Michigan, Chicago



How to Save Decayed Trees

BY A. H. SCOTT, 44

*Livingstone Ave
Pittsfield, Mass*

DURING recent years, the art of tree surgery has made great strides, owing, in part, to the attention drawn to the problem of preserving our fast-disappearing supply of lumber.

The secret of successful tree surgery lies in the prevention of any possible contact of water with the woody fiber of the tree, and it is just in this one point that the uninstructed man fails. By following the directions given here, an aged and

sound wood. This usually means enlarging the cavity to several times the original size, but it is absolutely necessary that none of the rotten brown particles be left to form a new nucleus of decay. Care must be taken that the bark is not loosened when cutting around the edges of the cavity; this is best done by striking the first blow with the gouge slanted inward, then drawing it away from the edge. Having thoroughly cleaned the



At the Left, the Cavity Cleaned, Braced, and Ready for Filling; at the Right, the Cavity Filled, Showing How the Cement is Laid in Sections and Smoothed Off So That the Growing Bark can Push Easily across the New Surface

decayed tree may be given a further period of life and its beauty preserved as part of the landscape.

The tools needed are: a 2 or 3-lb. mallet, a heavy 2-in. gouge, and a 1-in. and a 1½-in. chisel; the necessary materials: cement, sand, disinfecting solution, coal tar, burlap, and bolts, together with some miscellaneous material that will be mentioned later.

Using the gouge, the rotten matter should be cleaned out, right down to the

cavity, the margin should be smoothed off to a continuous line as indicated in the various views.

The top of the cavity is undercut, and the bottom slanted upward, as shown in Fig. 2. The sides should be leveled off with a flat chisel before cutting the water-course; this is designed to drain off any water that might enter the sides of the cavity, and should be from ¾ to 1 in. wide and extend the full length of the cavity. It is cut to a depth of from ⅜ to ½ in.

It is essential that the watercourse is clean-cut and level, so that it will drain even the smallest quantity of water finding its way between cement and wood; the chisel and a sharp-pointed knife will accomplish this if carefully used. The bark at the edges of the cavity should be leveled off at an angle of 45° , and a $\frac{1}{16}$ -in. strip of bark cut off all around the cavity, exposing the bare wood, as shown in Fig. 2. This strip, the beveled edge of the bark, and the watercourse are quickly painted over with any heavy paint at hand, to prevent drying of the bark.

The sides of the cavity are then braced by $\frac{3}{4}$ -in. bolts, spaced 12 to 14 in. apart, as shown in Fig. 1; $\frac{3}{4}$ -in. iron rods, threaded at both ends and fitted with four nuts, are best for this purpose, the holes being bored with an extension bit. The outer nuts should be countersunk into the tree, and each countersink treated exactly as though it were a miniature cavity. The entire cavity should now be thoroughly disinfected with a solution made by dissolving bichloride-of-mercury tablets

(poison) in denatured alcohol, one tablet to each quart. When the cavity is dry, it is given a coat of hot coal tar, which is best applied with a long brush, nailed to a stick. The tar must be kept out of the watercourse.

The cement, in the proportion of three shovelfuls of sand to one of cement, is now prepared, using only enough water to bring the mixture to such a consistency that a ball of it, when squeezed in the hand, will retain its shape. Mark a point halfway between the bottom of the cavity and the first bolt, nail on a piece of burlap, completely inclosing this portion, and fill in the cement, tamping it in thoroughly. Smooth off the top of the cement, slanting it upward toward the back, and over it place two layers of roofing

paper, cut to the contour of the cavity. Hold this paper in place with nails stuck through it into the cement.

Nail another piece of burlap up to a point midway between the next two bolts, fill in the cement, and repeat the operation until the cavity is filled. If the cavity is a shallow one, nails or spikes should be driven into the sides to assist in holding the cement. Pull off the lower burlap and smooth off the cement, continuing upward as the cement sets. A small mason's trowel and molder's slick make the best tools for this purpose. The cement surface should meet the $\frac{1}{16}$ -in. strip accurately, to enable the bark to grow over the cement easily. The countersinks are then filled in and smoothed off; the roofing paper can be trimmed close when the cement is hard.

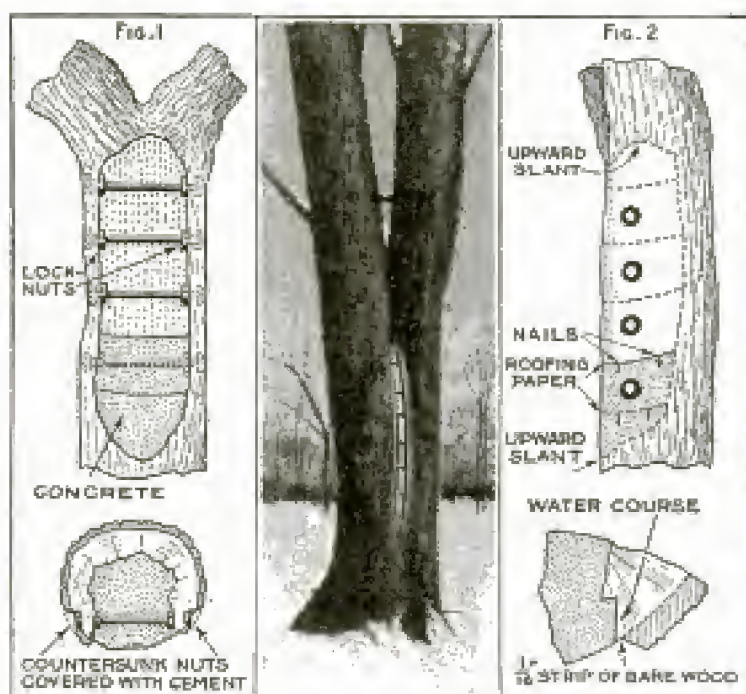
If the cavity extends up into the crotch of the tree, the main branches should be tied with a strong rope, to prevent the tree from splitting until the bolts are in place. In this case, these branches should be permanently chained together slightly more than half-

way to the top of the tree, and bolts put through just above the crotch, if the tree is large.

The growth of new wood over the cement may be doubled in speed if the edge of the past year's growth is slightly skinned with a knife each spring, and once during the early part of the summer. This causes the bark to reach out instead of curling under, especially if the surface of the filling is rough.

Locating a Keyhole in the Dark

The insertion of keys into keyholes and the location of doorknobs, in the darkness, are simplified if the surface about the keyhole and knob is coated with luminous paint.



Left, Method of Bracing and Filling in Concrete; Right, How the Cavity is Cut and the Sections Divided; Center, Cavity Extending into Crotch. Note the Bolt between the Two Main Branches

An Improved Stone Boat

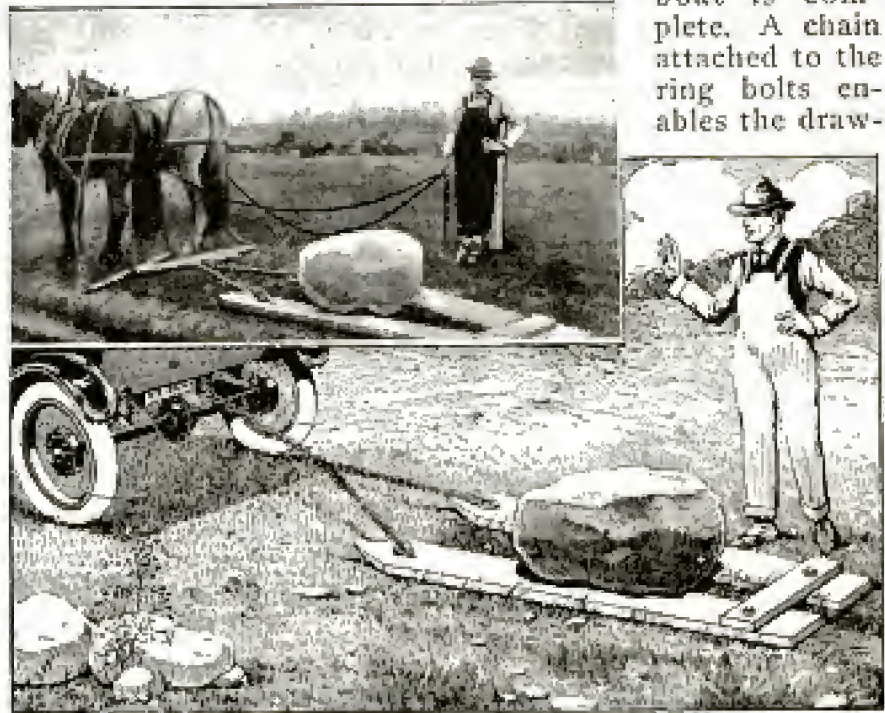
For building garden walls, stone fences, laying foundations, or similar masonry work that requires the transportation of heavy stones or other weighty masses, the old stone boat can well be resorted to. The farmer perhaps appreciates the utility of this "vehicle" better than anyone, and he knows that it is easier to move heavy objects horizontally than vertically. However, the stone boat that is now helping the settlers of cut-over lands to avoid the dangers of hernia and strained backs in the clearing of their land, is built along different lines from the old type.

Large weights that are to be moved by a stone boat are usually dragged by a team of horses, yet one man can pull a surprisingly heavy object with it, and two men can make quite a showing; if handled carefully, a light car can also furnish the pulling power without undue strain.

The making of a stone boat of the type illustrated requires only two pieces of plank, about 8 ft. long, a wooden cross-piece, two straight bolts, and two ring bolts, together with the necessary length of chain. The planks are pointed at one end, and the two squared ends are bolted to the crosspiece, which should be of about 2 by 8-in. stuff and less than 2 ft. long. A space of several inches is left between the planks at the crosspiece, to

permit the rear ends to move together when pull is applied to the forward ends. On fastening the ring bolts to the front end, about 1 ft. from the point, the stone

boat is complete. A chain attached to the ring bolts enables the draw-



A Stone Boat for Moving Heavy Boulders or Tree Stumps: This Type of Boat Itself Lifts the Load, Thus Relieving the Operator of Much Heavy Work and Clearing the Land More Rapidly

bar pull to be applied at a convenient distance from the pointed ends of the planks.

This particular type of stone boat works like a pair of scissors. Placed behind a stump or boulder, it opens up as the pulling power forces its two pointed planks apart. As the pull is steadily applied the load is lifted or rolled onto the stone boat and then hauled away. Where a team, or other pulling power, is available the operator has no work except to adjust the pointed planks and the chain—this stone boat loads itself.—Mark G. Troxell, Madison, Wis.

Making Gun Greases

During the war, the deterioration of arms and equipment of different kinds from rusting was a serious matter, and the government spent much time and money in extensive experiments upon "slushing oils" for the prevention of rust. As a result of this work, the following formulas were developed and gave excellent results:

Resin (preferably H-grade) 1 part, vaseline 10 parts, and kerosene 1 part. The resin is melted and mixed with the previously heated vaseline. The mixture is

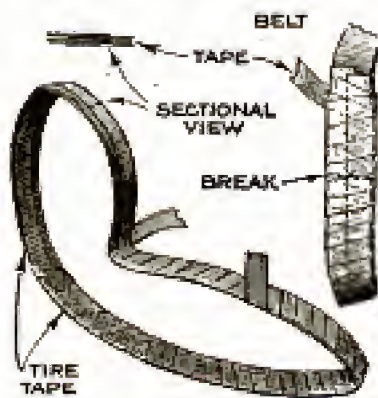
stirred well while cooling, and then the kerosene is added. If a more solid grease is desired, a little candelilla wax may be substituted for a part of the vaseline. The more wax used, the more solid will be the resulting grease. In government tests, this mixture almost perfectly preserved bright-steel plates that were exposed to outside winter weather for eight months.

Two other formulas are given for semi-solid greases, as follows: Formula A; candelilla wax 3 parts, resin (preferably, but not necessarily, H-grade) 6 parts, and vaseline 50 parts; Formula B; 2 parts

carnauba wax, 5 parts resin, and 50 parts vaseline. The materials in the above formulas should be heated together to about 250° F., until all the ingredients are melted, and the mixture thoroughly stirred while cooling. They are best applied so as to cover the surfaces completely. When it is desired to remove the grease, slightly warm the article protected by it, and wipe off with a clean cotton cloth.—Chas. E. Mullin, Philadelphia, Pa.

An Emergency Fan Belt

In an emergency, when a fan belt breaks or is lost, a serviceable substitute, that will hold until the proper kind of belt can be obtained, can be made from tire tape.



Such a belt is made by looping about four layers of tape to make an endless ring of the proper diameter. Each layer is slightly staggered as in the sectional view. A diagonal wrapping in each direction is then applied for further strength. Under some conditions, when the belt is not lost, it can be repaired with tape strips.

Roller for Decorators' Stencils

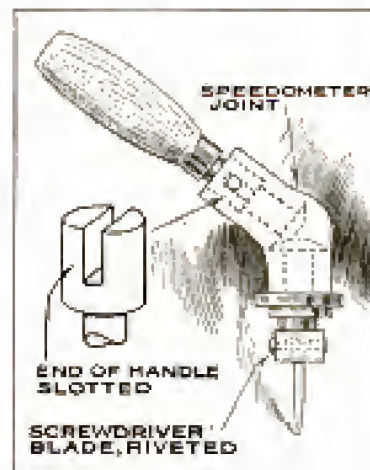
Nearly all stencil brushes will tear the ties and fine lines of complicated decorators' stencils and patterns. To overcome this, I make use of a tool that works faster and gives better results than the brush, and saves the stencil. A wooden roller, about 3 in. in diameter, has a slot, 1/2 in. deep, cut parallel with its center. The roller is covered with a piece of plush or felt, preferably the former, about an inch longer than the circumference of the roller, the excess material being forced into the slot and tacked to hold it in place. Pins are driven into the ends of the roller, and a handle is made from stiff wire and bent over the pins. The paint, or calcimine, is spread on a board, or slab, and the roller is run over this until the plush or felt covering is sufficiently charged with color; the roller is then run over the stencil.—C. F. Herbert, Chicago, Ill.

Concrete Piles without Forms

Although concrete piling is no novelty, a method of using bored holes as forms for foundation piles for a summer cottage may be of value in many instances. To secure solid footings for the sills in the case in question, an 8-in. post-hole auger was used, and the holes were bored about 5 ft. deep and 6 ft. apart. Sill levels were established and the holes filled with the concrete mixture to the ground level. Short sleeves or forms of 8-in. stovepipe were then forced into the soft concrete in each hole until the tops were on the established sill level. These extension-sleeve forms were then filled with concrete, with suitable anchor bolts imbedded in it.—T. W. Ingersoll, Buffalo, Minnesota.

Geared Offset Screwdriver

A screwdriver, for use where the space above the screw head does not permit the application of the usual straight-handle type, is made, as shown in the drawing,



from a speedometer joint, in which two bevel gears rotate shafts held at an angle to each other. There are usually two such joints on each speedometer, at the points where the

flexible shaft is connected. The joint is modified by riveting a screwdriver blade to one end and fitting a handle to the second shaft, as indicated. In use, the casing about the gears forms a convenient hold for the palm of the left hand, while the right hand is used to turn the handle.

Es C. Luero, 3104 Mt Pleasant Washington, D.C.

Ammonia for Cooling Hot Bearings

When a 100-hp. motor, running at 1,800 r.p.m. and driving a blower used to furnish the induced draft to a battery of six boilers, developed a hot bearing on the pulley side, it created a problem that was satisfactorily solved by cooling the overheated bearing with chemically pure ammonia.

The heating was caused by excessive

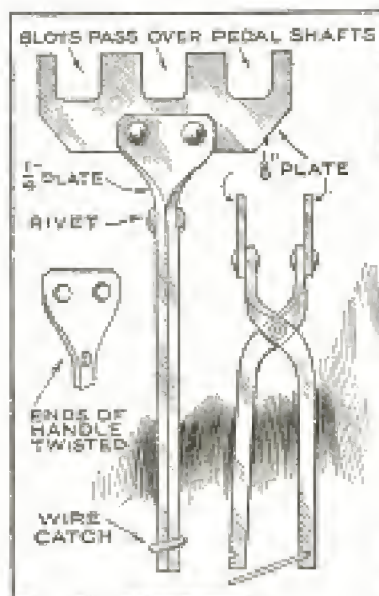
tightness of the belt, but although the tension was decreased immediately this was noticed, the bearing failed to cool, and as it was impossible to shut down the motor until the bearing cooled off, and flooding the bearing with oil produced no result, the ammonia treatment was used as a last resort. A small amount of chemically pure liquid ammonia was mixed into an emulsion with the oil, and the mixture was carefully and slowly fed into the bearing drop by drop; it sputtered at first, but after about 15 minutes' steady application, the bearing had cooled nearly to normal. The oil was then changed, and no further trouble was experienced. If the liquid ammonia is not chemically pure and nearly free from water, the water in the mixture will decrease the lubricating property of the oil sufficiently to render it useless for high-speed bearings. This system of cooling bearings by utilizing the rapid-evaporating qualities of ammonia has since been used many times with perfect success.—C. E. Diehl, Mammoth, Utah.

Tool Clamps Auto-Transmission Springs

When replacing the cover of the light-automobile planetary transmission after repairs have

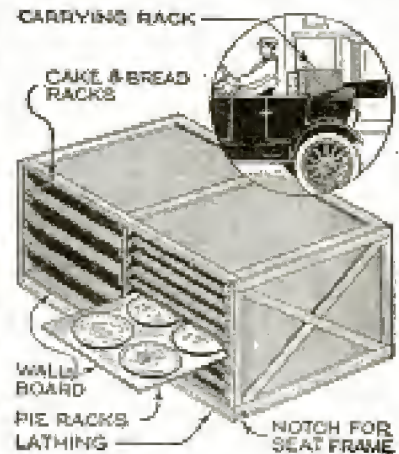
been made, much difficulty is experienced in compressing the springs enough to get them between the ears of the transmission bands. The tool shown in the drawing is specially adapted for this purpose; it will compress the springs and

hold them so that they can be inserted easily. The tool consists of a simple pair of tongs or pliers provided, on each jaw, with a slotted plate that fits over the springs. A link or catch in one of the handles slips over the opposite handle and retains the adjustment. The use of such a tool will immediately reduce the time of placing the transmission cover, especially when new lining has been placed on the brake bands.



Rack Makes Delivery Car of Touring Car

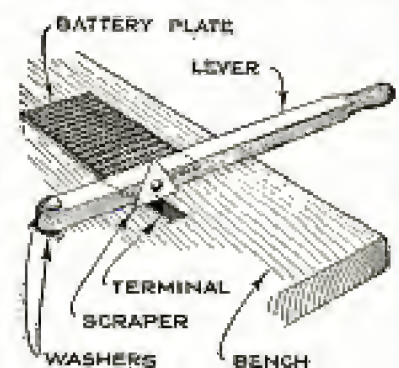
A baker made use of his passenger car to deliver the products of his shop to customers, by adding a rack that fitted



bottom, to fit over the edge of the frame that retains the cushion. The whole rack was suitably reinforced with lattice strips, and shelves were made from wallboard, sliding on light strips. A central partition divides the rack into two compartments. This arrangement is easily removed from the passenger car and saves its user the cost of a commercial truck. The original rack has eight shelves with a capacity of 64 pies, but the shelving can be adjusted as desired.—O. H. Hampsch, Nashville, Tenn.

Scraping Battery Terminals

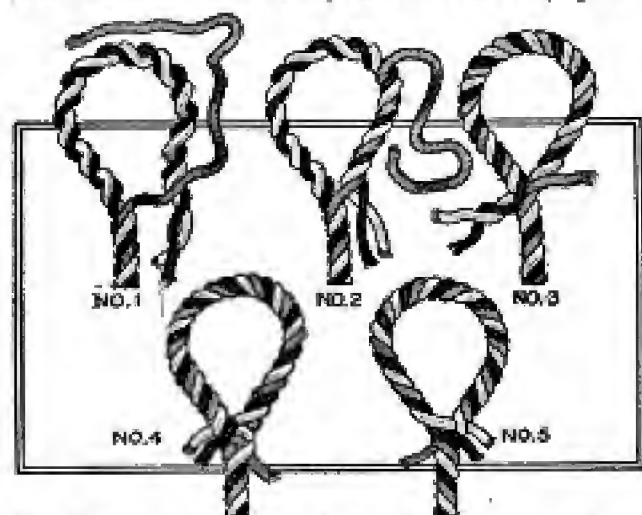
Scraping the scale from the terminals of storage-battery plates is a tedious and time-consuming job, requiring a strong



arm for continued work when done in the ordinary manner. By making and using a scraper of the type shown, in which the blade from an ordinary hand scraper is attached to a lever, the obstinate scale, on the positive plate in particular, can be removed with but a single operation for each surface, and the leverage makes greater speed possible. The lever is permanently attached to the bench top and has just enough vertical play to permit the insertion of the plate terminal underneath the scraper blade.—H. Sibley, Pasadena, Calif.

A Superior Eye-Splice

Unless the workmanship has been very good, an eye-splice of the ordinary kind will become loosened, and eventually pull



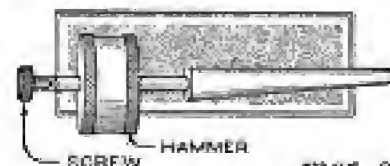
The Various Operations Required to Make an Eye-Splice Superior to the Usual One: The Steps Require but Little More Time than the Old Way

out when the rope is subjected to intermittent but excessive strain. In order to prevent this, the splice, shown in the drawing in the successive operations of making it, has been devised, and as can be readily seen, the rope must break before the splice will pull out. The splice is built on the principle of the one-strand grommet. A bight is made in the rope, one strand is unlaied, and then relaid around the eye in reverse order. The three ends are then worked under and over after the usual manner of making a short splice, or finishing an eye-splice. The work can be done in very little more time than is usually required for the other type, while the strength is greatly increased.—G. Dallas Hanna, San Francisco, Calif.

A Handy Drill-Press Drift

A handy drift for knocking out sockets or taper-shank tools, made as shown in the drawing, does away with the necessity of using a hammer, and leaves one of the operator's hands free to catch the socket or tool as it is released.

Made of $\frac{1}{4}$ -in. flat stock, it is turned down at one end to form a guide for the sliding weight which takes the place of the usual hammer; the screw in the end prevents the hammer from sliding off. The side of the hammer is made concave



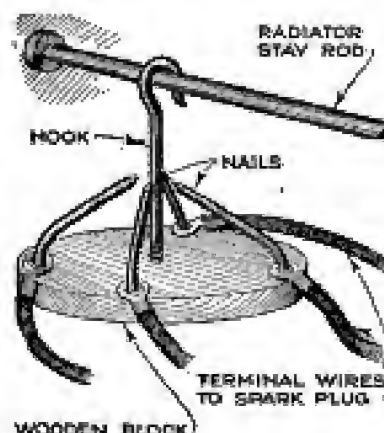
to provide a better grip for the fingers. The drift is used in the same manner as ordinary ones, the blow of the hammer against the end of the tapered drift releasing the socket or tool.

Tractor Started with Carbide

For starting my tractor in cold weather, I have a small tin can with a few $\frac{1}{16}$ -in. holes punched in it. A handful of waste is dipped in water and the surplus squeezed out. Four or five pieces of calcium carbide, the size of a pea, are placed in the middle of the wad, which is placed in the can. The can is shoved into the intake, and the flywheel turned over until the engine fires, which is usually on the first or second turn. As soon as the engine is operating properly, the acetylene-generating can is removed and placed in the toolbox.—Russell Adams, Seward, Oklahoma.

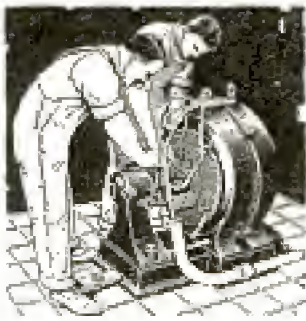
Tester for Auto Ignition

An efficient tester for the ignition circuit of an automobile can be made from a circular block of wood, a screwhook, and some nails, as shown in the drawing. The nails are driven through the wooden



disk, around the edge, and are bent over so that the points are at the proper distance from the central screwhook, by which the tester is suspended from the radiator stay rod. The spark-plug terminal wires are slipped over the nails and the motor turned over. Perfect sparking at the tester indicates that the ignition units are operating up to the spark plugs. For six and eight-cylinder engines a larger number of nails will be required, as one is needed for each spark-plug wire.

¶ In some drafting rooms the practice is followed of making long dashes for invisible lines, not only because they require less time, but also to preclude the possibility of a short dash near a dimension being mistaken for the figure 1, and read as part of the dimension.



TESTING MOTORS, GENERATORS, and TRANSFORMERS

By KENNETH C. COGGESHALL

Part I—Motors

TESTS on motors, generators, and transformers are usually made to ascertain if the apparatus can carry additional load without injury; to make certain that the rating guarantees have been fulfilled; to see if the temperature rise is within safe limits; to determine the efficiency of the apparatus under varying loads, or to find the most economical conditions of operation.

It is often necessary to find the resistance of the windings, and this is done by connecting a voltmeter and ammeter in the circuit, as shown in Fig. 1, using a direct-current supply. The basis of this method, known as the fall-of-potential method, is Ohm's law, which states that the resistance of any circuit, in ohms, is equal to the electromotive force, in volts, divided by the current strength in amperes. Expressed as a formula, this is:

$$R = \frac{E}{I},$$

where R is the resistance in ohms, E the voltage, and I the current strength in amperes. The values of E and I are read from the meters simultaneously. It should be understood that the resistance of a winding increases with a rise in temperature, consequently, for purposes of comparison, it is best to note and record the temperature of the winding when the test is made.

The power input to a direct-current motor is measured as shown in Fig. 2, the connections being very similar to those of Fig. 1. While the motor is running under various loads, several readings of the ammeter and voltmeter are recorded, and the average value of E and I obtained. The product of the average values of E and I is expressed in watts, and represents the power input to the motor. The formula is:

$$P = E \times I,$$

where P represents the power, expressed in watts; E and I are, of course, the voltage and current strength as in measuring resistance. If the power is to be expressed in horsepower units, the product of E and I is divided by 746, as 746 watts are equivalent to one horsepower

(Hp.); the formula then becomes:

$$\text{Hp.} = \frac{E \times I}{746}.$$

By comparing the ammeter reading with the full-load current value, as shown on the motor nameplate, a fair estimate of the load on the motor may be made, where no more accurate method of determining the load is available.

The efficiency of a machine is the ratio of the output to the input, or the power given out divided by the power supplied. Motor efficiency may be determined either by the measurement of its losses, or by actually measuring the output by mechanical or other means. The mechanical method, while not so accurate, is the simpler, and is the only one that will be described here. As shown in Fig. 3, a Prony brake is used to measure the horsepower produced. This consists of a pair of brake blocks, clamped on the pulley of the motor; a long lever fastened to one of the blocks, and a spring balance. If L represents the distance, in feet, from the center of the pulley to the center of the spring balance; W the pull or weight shown on the scale, and N the number of revolutions per minute of the motor, then

$$\text{Hp.} = \frac{2 \times 3.142 \times L \times N \times W}{33,000};$$

by making the length L equal to 5 ft. 3 in., the formula may be simplified to

$$\text{Hp.} = \frac{N \times W}{1,000};$$

that is, simply multiply the number of revolutions per minute by the weight shown on the scale, and divide by 1,000. If this result is multiplied by 746, the number of watts delivered is obtained, and if this figure is divided by the input, as calculated from the meter readings, the efficiency of the motor is obtained. The formula is:

$$\text{Efficiency} = \frac{746 \times \left(\frac{N \times W}{1,000} \right)}{E \times I},$$

Another formula,

$$\text{Efficiency} = \frac{8.52 \times L \times N \times W}{E \times I},$$

may be used; in this formula, N is the

number of revolutions per *second*. The result of either of these formulas, multiplied by 100, will give the percentage of efficiency.

It is often desirable to know at what load a motor operates most efficiently; some motors, for example, show their peak efficiency at a slight overload, others, again, at slightly under full load. To test, take readings at various loads, up to 50-per-cent overload, as compared with the nameplate rating. Using these values, calculate the output for each reading, and for each output value compute the per cent efficiency. This information can then be put into graphical form, as shown in Fig. 4. The curve will show the point of highest efficiency, as that point will be the peak of the curve.

Tests on alternating-current machinery cannot be carried out in the same manner as on direct-current apparatus. Another instrument, the wattmeter, must be employed to measure the actual power input or output. This is necessary because the voltage and current alternate in value from positive to negative, completing each second as many cycles as the frequency of the generator; the current strength also either leads the voltage or lags behind it, usually the latter, therefore the product of the volts and amperes is not the actual, but only the apparent power. The true or actual power is shown by the wattmeter, which is designed to compensate for what is known as the power factor.

The apparent power, in watts, is indicated by the formula:

$$P = E \times I,$$

but the actual power is

$$P = E \times I \times P.f.,$$

and the power factor (P.f.) is equal to the actual watts divided by the apparent watts, that is,

$$P.f. = \frac{\text{Actual watts}}{\text{Apparent watts}}.$$

The connections for testing a single-phase a.-c. motor are shown in Fig. 3. Taking the values of E, I, and P, where P is the wattmeter reading, then

$$P.f. = \frac{P}{E \times I}.$$

The kilowatt (Kw.) input is

$$Kw. = \frac{E \times I \times P.f.}{1,000} = \frac{P}{1,000}.$$

If a Prony-brake test is made, then

$$\text{Efficiency} = \frac{746 \times \left(\frac{N \times W}{1,000} \right)}{P},$$

that is, multiply the number of revolutions per minute by the weight, divide by

1,000, multiply by 746, and divide the last result by the wattmeter reading.

The formula

$$\text{Efficiency} = \frac{8.52 \times L \times N \times W}{P}$$

can also be used, N again being the number of revolutions per *second*.

To test a three-phase a.-c. motor, six instruments are necessary, as shown in Fig. 6, except where a switching system is provided, as in Fig. 7, when the tests may be made with but three instruments. The total input, in this case, is the sum of the wattmeter readings. If the load is very light, it is possible that one of the wattmeters will show a negative value. To obtain a reading, reverse the current leads. In this instance, the actual watts input is the reading of the positive wattmeter minus the reading of the one the connections of which were reversed.

It should be realized that the values found for each phase are not one third of the total, and that, considered individually, they mean nothing. In reality, the apparent power is equivalent to the product of E and I multiplied by the square root of 3, that is,

$$\text{Apparent power} = E \times I \times 1.73,$$

in which

$$E = \frac{E_1 + E_2}{2}, \text{ and } I = \frac{I_1 + I_2}{2}.$$

The total power is

$$P_1 + P_2;$$

and the power factor

$$P.f. = \frac{P_1 + P_2}{E \times I \times 1.73}.$$

In these formulas, it must be remembered that E and I are the average readings. E₁ is the reading of the upper voltmeter (Fig. 6); E₂, the reading of the lower one; and similarly for I₁, I₂, P₁, and P₂. The average values of E are obtained, as stated in the formula, by adding the readings of E₁ and E₂ and dividing by 2. The average values of I are obtained in the same way.

By using a Prony brake to determine the horsepower output, the efficiency at any load can be computed, and the data recorded graphically.

$$\text{Efficiency} = \frac{8.52 \times L \times N \times W}{P_1 + P_2},$$

N being the number of revolutions per *second*. If the full-load efficiency is known, the output in horsepower may be calculated thus:

$$Hp. = \frac{(P_1 + P_2) \times \text{Efficiency}}{746}.$$

In order that the operator may be able at any time to estimate quickly the output of the motor when the input is

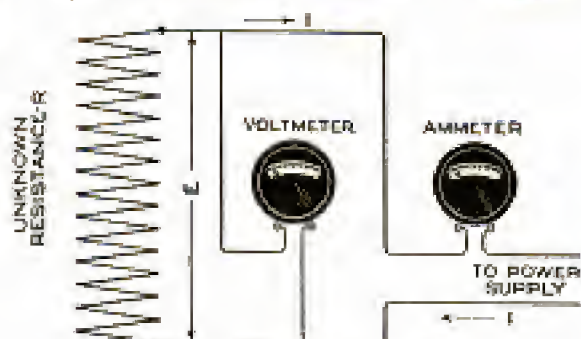


Fig. 1 MEASURING RESISTANCE WITH AMMETER & VOLTmeter

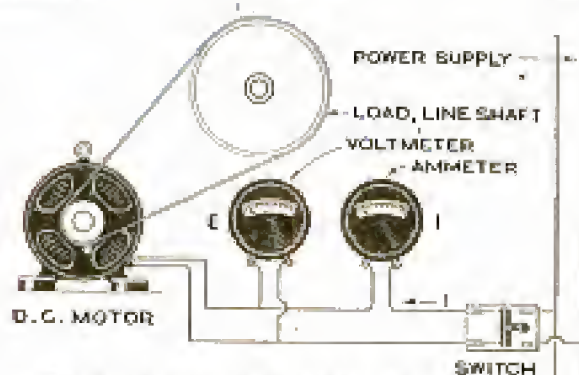
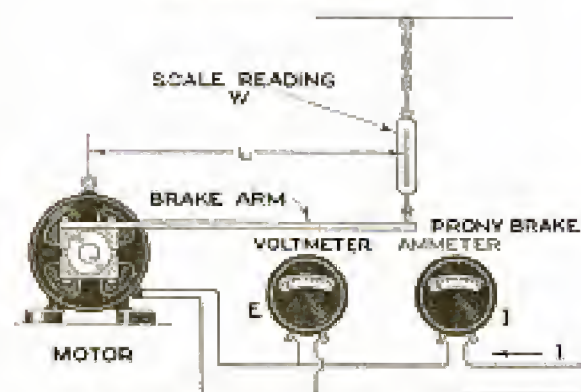


Fig. 2 MEASURING POWER INPUT



MEASURING MECHANICALLY POWER OUTPUT WHILE INPUT IS DETERMINED BY METER READINGS
Fig. 3

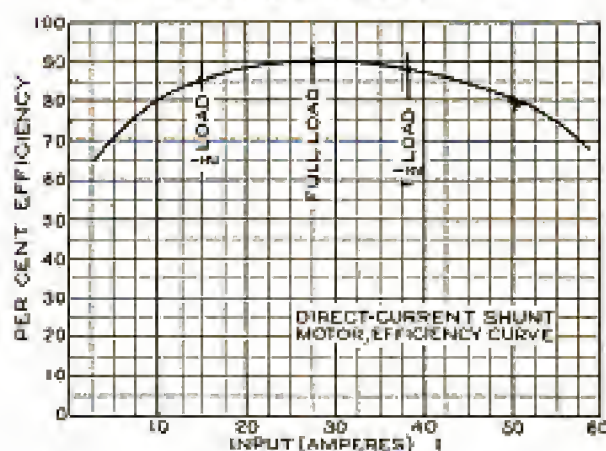
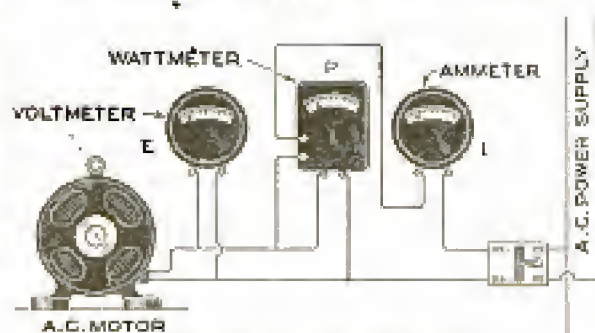
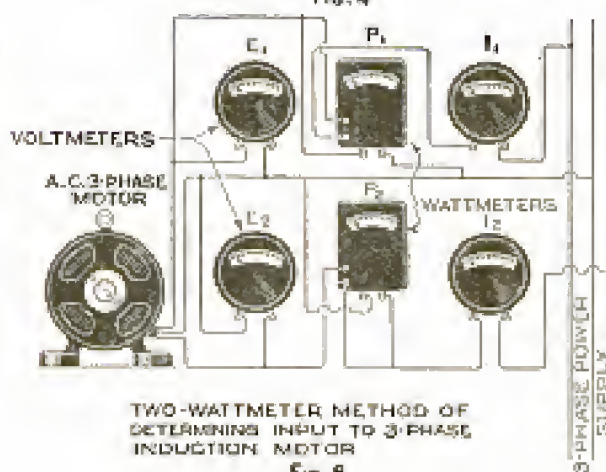


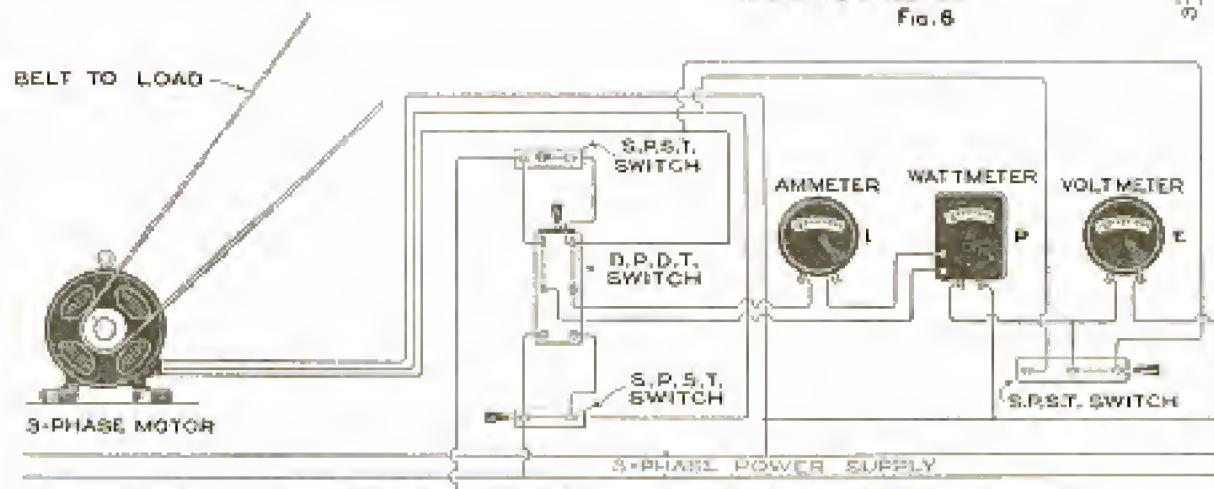
Fig. 4



INSTRUMENT CONNECTIONS FOR TESTING SINGLE-PHASE A.C. MOTOR
Fig. 5



TWO-WATTMETER METHOD OF DETERMINING INPUT TO 3-PHASE INDUCTION MOTOR
Fig. 6



ONE-WATTMETER METHOD OF DETERMINING INPUT TO 3-PHASE INDUCTION MOTOR
Fig. 7

Fig. 1 Shows the Method of Measuring Resistance; Figs. 2 and 3, Connections for Power Tests on Direct-Current Motors, and Figs. 5 and 6, Connections for Testing Single and Three-Phase Alternating-Current Motors.

Fig. 7 Shows How a Three-Phase Motor may be Tested with Only Three Instruments

known, an efficiency curve, as shown in Fig. 4, should be plotted.

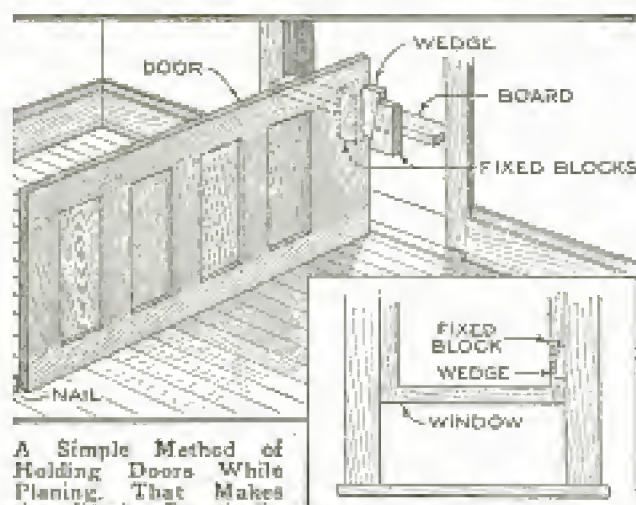
A very rough check of the power input can be made with only a voltmeter and ammeter connected in one phase. Compare the readings with the nameplate data. If the voltmeter reading is as specified, then the ammeter reading, as

compared with the nameplate value, will indicate whether the motor is over or underloaded.

In calculating either input or output, the values of E, I, P, L, N, and W must be read as nearly simultaneously as possible, dividing the work between several persons if necessary.

Wedge Holds Door for Planing

Carpenters, when planing doors, hold their work in a vertical position by inserting the end in a notched board horizontally between the door jambs. However, the work is not held rigidly, and it must be supported by the workman. A



A Simple Method of Holding Doors While Planing. That Makes the Work Practically Immovable. The Smaller Drawing Shows How Heavy Windows can be Held in Any Position by Wedges

much more effective method makes use of tapered blocks affixed to the edge of the board, then, by inserting a wedge and tacking the door down to the floor at the opposite end, the work is practically immovable. Windows that overbalance their sash weights to such an extent that they cannot be kept up, can be wedged into position in much the same manner, as shown in the lower illustration.—Win. E. King, Monessen, Pa.

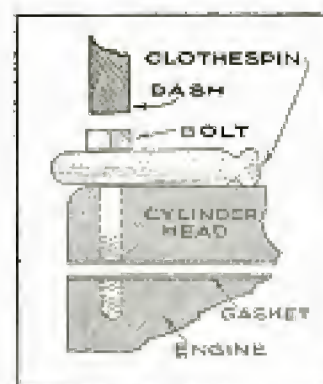
Protecting Sprinkler Heads

To be sure that an automatic-sprinkler system is in good order the sprinkler heads should be carefully watched. Sprinkler heads having four different melting points are made; the lowest is 160° and the highest 360°. The latter are used in boiler rooms, drying rooms, and other places where there is a high temperature at all times. Extreme care should be used in replacing the sprinklers, so that only those of the proper melting point are used. To get the greatest pro-

tection from the system, however, the heads should have the lowest melting point that can be safely used. Where chemical fumes or moisture come into contact with and corrode the heads, the protection is decreased, because the thin skin of oxide on the surface increases the temperature required to melt the fusible metal. This trouble can be overcome by covering the heads with a waxlike substance that melts at a temperature somewhat lower than that required to melt the head. In a case where the likelihood of corrosion is great the heads should be changed frequently. Under some conditions, as in woodworking shops, paper mills, and the like, the heads become coated with flying particles of sawdust or paper pulp, which hardens and thus reduces their effectiveness. Paint or calcimine, that is accidentally smeared over the heads when painting, also lowers their efficiency. When painting or calcimining, the sprinkler heads should be protected by tying small paper bags over them, removing the bags when the work is finished.

Clothespins Aid in Replacing Auto Cylinder Head

The last two bolts on the light-automobile cylinder head, are located directly underneath the dash, and must be in



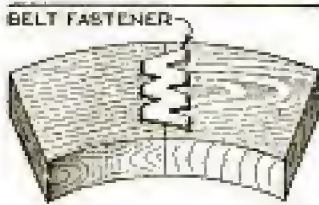
place while the head is inserted on the engine block. To push the head into place with these bolts protruding results in the gasket being bent or torn. The usual practice is to have a helper who holds the bolts while the cylinder head is being put on or taken off. A simple solution to this problem consists in the application of two clothespins, one underneath the head of each bolt, as shown in the drawing.

Sharpening Tools with Mill File

That a fine flat mill file may be used for sharpening and dressing tools is a fact that many mechanics have overlooked completely. Possibly it is not generally realized that the edges of scissors, tin-snips, screwdrivers, and numerous other tools, are softer than the file and can be dressed down to a sharp cutting edge. It is advisable to keep an old file with a broad surface for this purpose, and use it by clamping the tool to be sharpened in the vise. Occasionally a tool too hard to file will be met with, and for this reason the use of an old file is advised. In sharpening scissors, especially when used for cutting cloth, the file-sharpened edges are better than oilstoned ones. The file marks should run downward and inward on both cutting edges; the wire edge left by the file is removed by simply closing the scissors as in cutting.

Emergency Pinch Dogs

We had occasion to use a large number of small pinch dogs on a pattern job, and after we had used all we could find, we still needed several dozen more, and the shop boy came to the rescue with a box of belt fasteners. These were cut up so as to leave about three points on each side, and we discovered that the makeshift article was better than the regular manufactured pinch dog, as it not only drew the pattern segments together but prevented any lateral movement. Furthermore, any length suitable is easily made, they are cheap, and will not break at the corners like the factory-made article.—C. M. Graham, Waterloo, Ia.



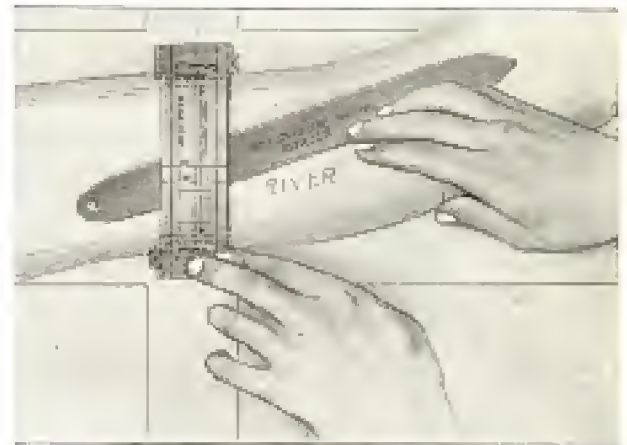
Insuring the Sweeping of Corners

One concern, which found that the janitors, when sweeping, consistently slighted the corners, has now painted all the corners in the factory white. The paint extends about a foot up the walls, and an arc of about 1-ft. radius is painted on the floor.

Where corners are dark, this brightens them up, and dirt is easily seen. The corners are not slighted now.—A. MacCullough, Chicago, Ill.

Bridge Models Show Problems Clearly

A little time spent in the drafting room in the making of models similar to those



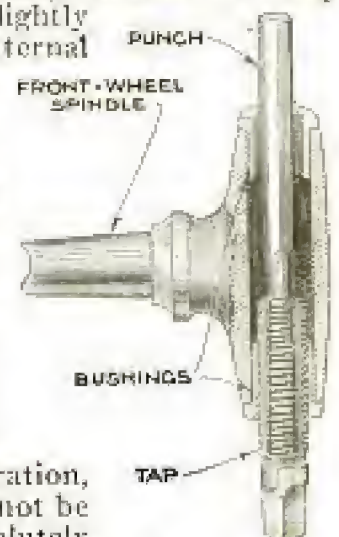
Paper Models for Showing the Relation of a Proposed Bridge to the Shipping That Must Pass Through, Makes It Possible to Present the Situation Clearly to Those Unfamiliar with the Problems Involved

illustrated will save a great deal of useless argument in consultation with engineers, business men, and commissions in large cities. It will be immediately apparent to even those most unfamiliar with the problems involved, just what size boat can pass up the river and through the proposed bridge. The outline model of the bridge is adjustable so that the distance between the abutments can be increased or shortened. It is only necessary to place the models, which are cut from ordinary Manila drawing paper, on a map of the proper scale to make the situation self-explanatory.

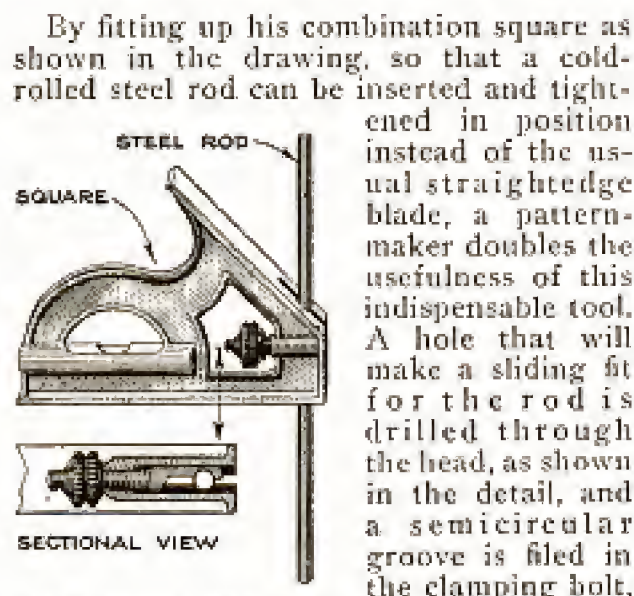
Bushings Removed with a Tap

A simple and convenient method of removing a small bushing consists in cutting into it with a tap slightly larger than the internal diameter of the bushing. With the tap in place, a punch or drift is used to drive the bushing out from the opposite side, in cases where this is possible.

Old taps are useful for this purpose and, as the tap is likely to be injured in the operation, a good tap should not be used unless absolutely necessary, and then only with great care. Coarse-threaded taps are better than finer ones for this purpose.



Useful Attachment for Square

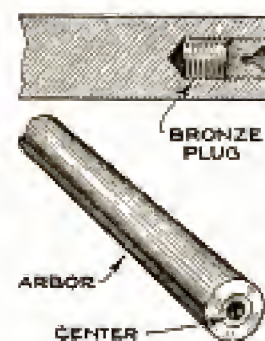


just back of the jaw, to allow the rod to pass through it.

This arrangement enables the tool to be used as a depth gauge in small holes or slots where the rule will not enter; by inserting a small steel point near one end of the rod, a good marking gauge is formed.

Improved Centers for Arbors

An improvement on lathe and milling-machine arbors, that overcomes the all too familiar burring of the centers, has



The plug is screwed in flush and centered in the usual way. The bronze center produces a bearing that is tough, yet not hard enough to burr the lathe centers.—John M. Pipp, Muncie, Ind.

Umbrella Ribs for Welding Rods

I have been using the ribs from old umbrellas in place of welding rods for such work as lengthening twist drills, augers, and for sheet-metal work, with perfectly satisfactory results. On account of the thinness of the ribs a smaller flame

is required to melt them, and no hard spots are apparent in the weld when machining or filing. When the neutral flame strikes the rib, numerous sparks will appear which may cause the operator to believe his torch is not adjusted properly, or that the steel is burning. This is merely the action of the oxygen on the rust and enamel on the rib, and does not interfere with the free flow of metal into the weld.—Fred Brand, Middletown, N. Y.

Cutting Brake-Band Rivets

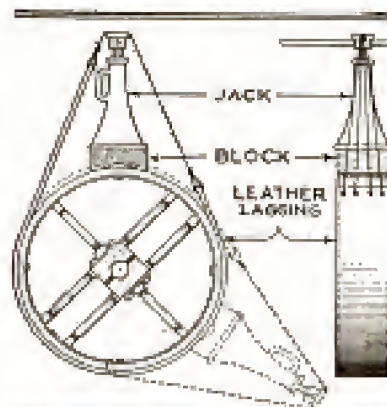
To cut off the old rivets cleanly, when relining brake, clutch, or transmission bands of an automobile, without bending them over, the cold chisel used should have a specially ground edge.

The ordinary cold chisel is beveled on both sides, but, to get the most satisfactory results with the type of rivets generally used for the purpose mentioned, the chisel should be ground with a bevel on but one side and used with the flat side against the band.—J. H. Rouse, San Francisco, California.



Stretching Leather Lugging on Pulleys

When it is desired to stretch a piece of leather over the face of a pulley to increase its diameter, or to reduce slip, and to rivet it in place, the mechanic finds that he does not possess enough



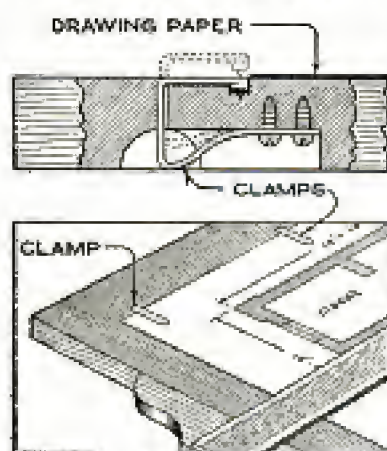
hands and fingers to manipulate the lever that is commonly used, and to insert and head over the rivets while the leather is taut.

The drawing shows how an ordinary screw-jack is used by one old-time mechanic to draw the leather lugging up tight, and hold it thus while the rivets are inserted and headed. Holes are punched through the end of the leather, which should be

about 3 in. longer than necessary to reach around the pulley. The ends of the belt are connected by a number of strong wires, twisted together into a single strand and placed over the head of the jack. With a V-block underneath the jack, the screw is turned until the leather, which has been previously soaked in warm water for about 10 minutes, is sufficiently stretched. Rivets are placed in holes drilled through the leather and pulley, except in two near the rim of the pulley on the side opposite the jack. The jack is loosened, the wire removed from one end and this end cut off squarely. The jack is then reset in the position indicated by the dotted lines, the free end of the wire being inserted into the holes in which no rivets were inserted. The leather is again stretched and the rest of the rivets inserted. The jack is then removed, the ends of the lagging scarfed off, and the final rivets inserted where the wires were attached. When the leather becomes dry, as nearly a perfect fit as it is possible to obtain will be the result.—Geo. G. McVicker, North Bend, Neb.

Clamp for Drawing Board

The clamp shown in the drawing eliminates the need of thumbtacks to hold standard-size drawings to the board, and

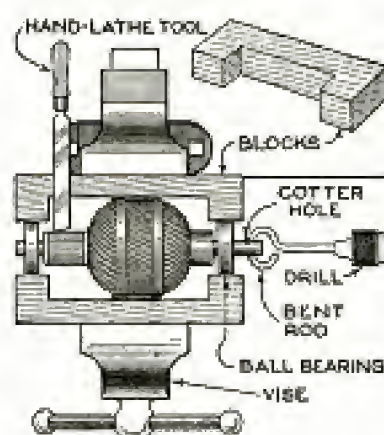


it will not spoil the board for use in making larger drawings, as the clamp is let in flush with the surfaces of the board. Only two clamps are used, and they are located at the top of the board in such a position that they will accommodate the majority of the drawings. The clamps are made from spring wire and fit into mortises of the proper size, cut in the surface of the board. A recess is made for the fingers on the underside of the board, so that the springs can easily be pressed upward.—Geo. Simonson, Cambridge, Mass.

☛ The boiler should be set 30 to 42 in. above the fire grate to give room for air and gases to mix.

Truing Small Commutators in a Vise

In truing up the commutator of a small motor generator, such as found in

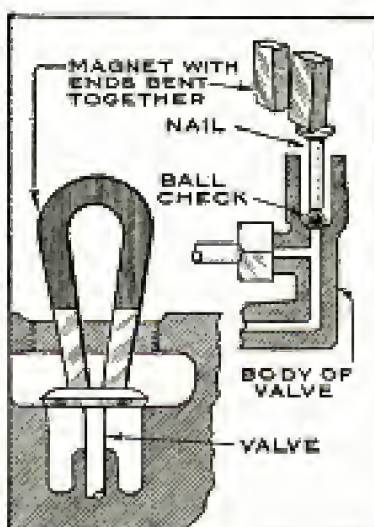


automobile electric systems, when no lathe is available, the vise set-up illustrated can be used. Two wooden blocks, relieved at their centers to clear the winding, are clamped in the vise, the

armature being held by its ball bearings, so that it can rotate freely. At one end of the shaft is a hole for a cotter or taper pin, and this is connected to a drill chuck in the manner shown. Then, while the work is being rotated, a hand lathe tool is brought to bear against the copper and the proper amount of metal removed. Sandpaper is used to smooth the turned work and give a polished finish.

Removing Ball from Check Valve

An ordinary horseshoe magnet, kept around the automobile repair shop, will make it possible to remove



easily the balls from oil check valves, inaccessible valves, and other parts that it is difficult to get a grip upon with fingers or tools. A magnet from an old magneto, with its ends bent close together, but not in contact with each other, can be found around almost any shop and will give excellent results. In removing the check-valve ball, a nail or similar short piece is inserted into the valve, and nail and ball drawn out together. Brass parts are unaffected by magnetism and therefore cannot be removed in this manner.

A Tap and Reamer-Milling Fixture

By J. V. ROMIG

INEXPENSIVE, yet a useful and time-saving addition to the shop equipment, the tap and reamer-milling fixture described in this article fully justifies the slight cost of its construction. With it, taps and reamers can be milled as quickly and as accurately as when using a large and bulky index head. Furthermore, this fixture permits the work to be done on

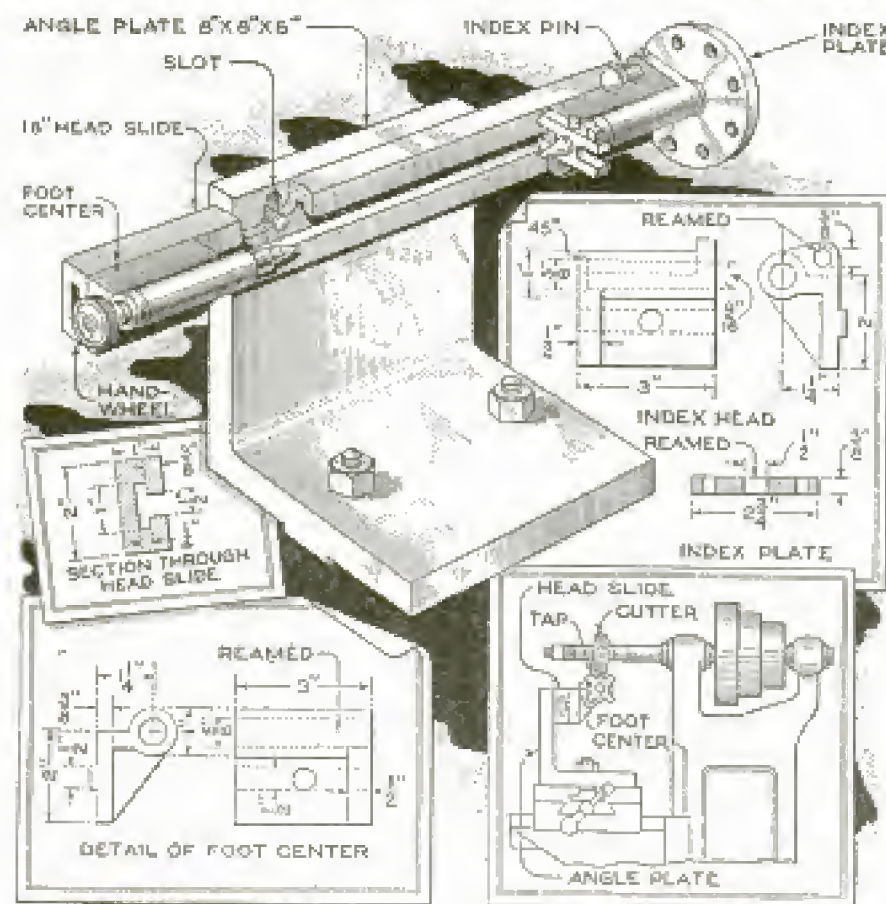
machined from cast iron to the form and dimensions shown; it is machined all over and the T-slot is cut throughout its length.

The index head and foot center are cast in soft gray iron from simple patterns, and machined to the dimensions given. The index-head spindle is taper-turned, and should be a snug fit in its bearing.

It has a center turned on its front end and is also threaded for the index plate.

The index plates, of which there should be several, say, one of 16 holes and another of 18 holes, give nearly all the spacings needed in the fluting of taps or reamers. The indexing is done by pulling the pin out, rotating the plate by hand, and then inserting the pin to hold the head in position. The foot-center head slides along the front face of the head slide, and can be clamped in any position to suit the length of the work held between the centers. The foot-center spindle should be of hardened tool steel and be fitted with a screw and hand-wheel for advancing the center into the work, as in a lathe tailstock.

By using a fixture of this type, more speed can be made on small



A Tap and Reamer-Milling Fixture That Has Its Index Head Self-Contained: It Accommodates Itself to Tapered Work, and can be Mounted on Small High-Speed Millers

a small miller, thereby saving the larger miller and its index head for larger and possibly more important jobs. Being self-contained in a single unit, much time is saved on the set-up of each job, as the fixture only requires to be clamped to the milling-machine table with two bolts.

The base of the fixture is an angle plate, machined square on its bottom and inside faces and having a tongue on the bottom machined to fit the table slots; to this the head slide is bolted with two capscrews. The capscrow on the index-center end is a turning fit in a hole drilled in the angle plate, while the other, at the foot-center end, slides in a curved slot, so that the slide can be tilted to take care of taper work. The head slide is

work, as it allows the work to be done on a high-speed machine of small size.

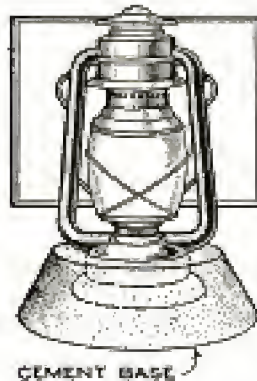
Lock and Chain Prevent Accidents

Deaths and accidents are often the direct result of a machine being set in motion by some one who does not know that there is a man working on it. Practically all such accidents can be prevented by providing the men who do work of this kind with a piece of chain and a padlock, and making the use of them compulsory, to lock the starting lever, switch, or whatever it is that makes the machine operative. In the same way, whenever it is necessary for a man to enter a boiler, gasometer, or similar ves-

sel, he should lock all inlet-control valves, and take the key along with him to prevent the steam or gas from being turned on. Sprinkler-system valves, and other valves that are connected to the fire-protection system, which should be kept open, can also be kept from being closed by the application of a lock and chain.

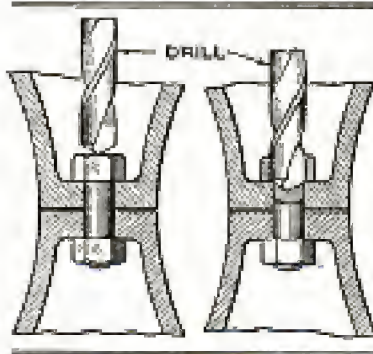
Cement Bases for Lanterns

Lanterns that are used by contractors and municipalities to warn traffic against obstructions or dangers in the roadway are easily upset and extinguished by the wind, when set on the ground. If suspended from a barricade or stake there is frequently considerable swaying that may dislodge the lantern and extinguish the light. However, by molding a cement base around the oil reservoir of the lantern it can be set on the ground with every assurance that it will not be blown over or accidentally upset.



Removing "Frozen" Bolts

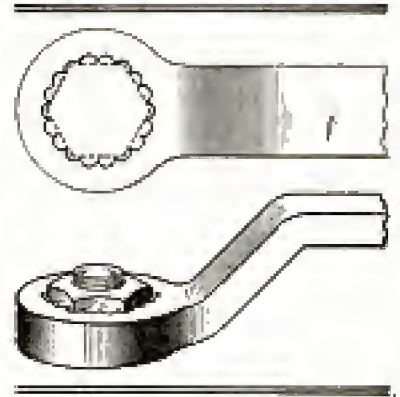
Owing to rust, or the end of the bolt being riveted over the nut, bolts in the chassis of automobiles frequently resist all efforts to start them with wrenches, and sometimes they are so located as to prevent the use of a chisel or drift on the nut. A simple method for removing such bolts is to drill through the bolt head



down into the body of the bolt. Make a punch mark in the center of the head, and using a drill slightly larger than the diameter of the bolt body, drill as shown: if an air or electric drill is used, the bolt will be out in a comparatively short time. In any case the drilling method is better than cutting the head off the bolt, as there is no possibility of a flying bolt head striking and injuring anyone, breaking a window, or doing any other damage.

Wrench for Cylinder-Base Nuts

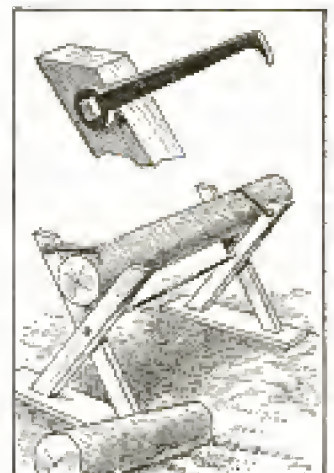
Cylinder-base nuts are, in many cases, so located that they can only be turned with a chisel. The reason for this is simple; the corners of the hexagon nut being 60° apart, the nut requires to be turned 60° before the wrench can be replaced on it and the turning movement continued: on the other hand, conditions usually permit turning the wrench no more than 30° , obviously making it impossible for the common wrench to resume its hold on the nut.



The drawing illustrates the construction of a simple wrench that will grip the hexagon heads of capscrews or nuts in any position so that the wrench can turn the nut as far as possible. A circle of holes is drilled in the wrench, as indicated, and the center piece knocked out; with this arrangement, no matter in what way the wrench is applied, the corners of the nut or bolt head will fit into some of the holes in the manner shown. The wrench head should, of course, be case-hardened.—C. Nye, New York, N. Y.

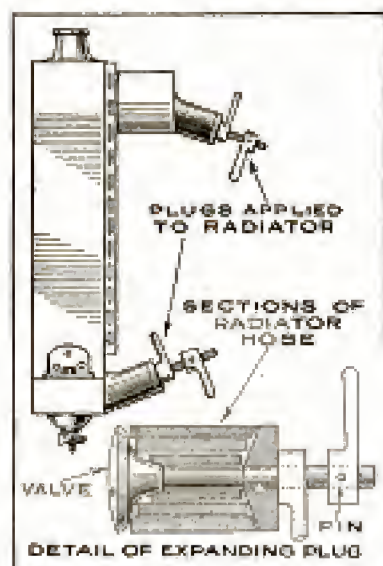
Dogs Aid in Sawing Wood

Two simple grippers, or dogs, fastened to opposite sides of a sawbuck, as shown in the drawing, will greatly facilitate the work of sawing wood into stove lengths, by holding it so that it cannot move as it is being sawed. The dogs are made of iron and bolted to the buck in the manner shown. In use, the sharp points are pressed into the wood, relieving the sawyer of all the effort that is generally required to keep the wood from turning a little with each stroke of the saw.—P. T. Williams, Hairoa, N. Z.



Plugs for Radiator Testing

Old automobile valves are utilized for the essential parts of the automobile-radiator testing

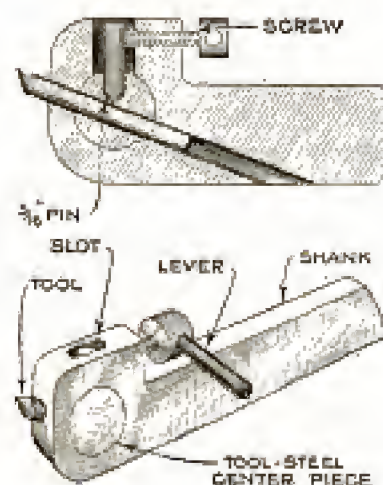


plugs shown in the drawing. The end of the stem is threaded and two threaded handles and a conical washer are provided. In assembling the plugs, a number of sections of heavy rubber tubing of different diameters are slipped over

the valve stem, the conical washer applied, and then the two handles, one of which is pinned rigidly to the valve stem, as shown. In use, the plugs are inserted into the openings of the radiator headers and the handle screwed down; this forces the sections of rubber tubing against the valve head and conical washer, causing the rubber to expand and completely fill the opening, so that the radiator can be tested for leaks.

A Novel Toolholder

The toolholder shown will be found handy when used on work that requires a frequent changing of tools, as it is self-contained, requires no separate wrench to operate it, and is very quick in action.



Very little pressure is required to secure or release the tool, as the holder is built to secure extra leverage.

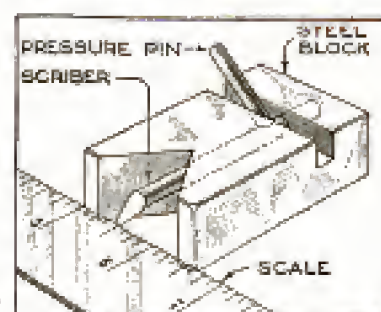
The body of the holder has a 1-in. hole reamed through it at right angles to the shank, and a $\frac{5}{16}$ -in. slot is cut in

the top. A short piece of drill rod is driven tightly into a disk of 1-in. tool

steel, which is made a snug fit in the reamed hole. The holder is drilled and tapped for a tightening screw, the head of which is drilled for a 3-in. length of drill rod that serves as a lever. When the piece has been thus assembled, a hole is drilled, at the proper angle, clear through the holder and the tool-steel disk or centerpiece. This hole is afterward broached square to take the tool bit. While the broaching is being done, a piece of packing is placed in the slot, and the screw is tightened on this to hold the centerpiece firm. The lever in the tightening screw should be set in a vertical position when the tool is released, one-quarter turn tightening the tool and bringing the lever down to a horizontal position. It will be immediately apparent that the screw, bearing on the pin driver in the centerpiece, forces the latter around and binds the tool on the bottom of the square hole.

Precision Scribing Tool

It is an exceedingly delicate operation to scribe a perfectly true line along the edge of a scale with an ordinary scriber



or scratchawl. Since the scriber is round and tapering to a point, and it is almost impossible to keep the hand in exactly the same position the whole time the line is being drawn, an uneven line usually results, which may cut through a

fine center on one end of the work and probably be off at the other. If the line is not exactly true, other attempts will be necessary, and this will make other fine lines that will be confusing.

The tool shown in the drawing will draw a dead-straight line exactly between two points, providing, of course, that the scale is accurately placed on the points. The body is a steel block, ground on the base, with a V-cut in the front end. The piece is drilled from the back end clear through to the center of the "V," to take the bent scriber, which is made as shown. A slot, cut across the top of the block, enables a pin to be threaded into the

scriber in a position at right angles to the scriber point. When the piece is thus assembled, a light finishing cut, preferably on the grinder, is taken across the front of the block and end of the scriber, insuring that these will form a dead-flat face.

In use, the block is placed close against the edge of the scale, and, with one finger pressing on the pin, the block is drawn along the scale, scribing a light or heavy line according to the pressure exerted.

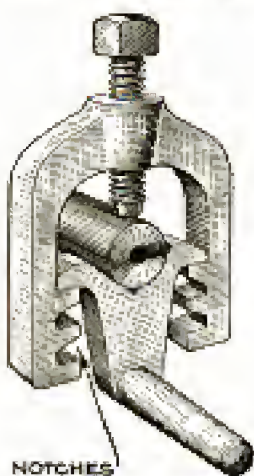
Auxiliary Automobile Seat

The auxiliary automobile seat illustrated is designed for the use of a child, and is simply constructed of iron rod and a board of suitable size to form the seat. The iron rod is bent to form a hook that fits over the back of the car seat, and the board is attached to the lower ends. Arms for the seat are made from the same material and fastened to the underside of the seat, which can be upholstered as desired, or, by the exercise of a little more ingenuity, the back and arms may be formed of one length of rod. Completed, the seat is intended to elevate the young passenger so that he can see over the side of the car.—F. C. Davis, St. Joseph, Mo.



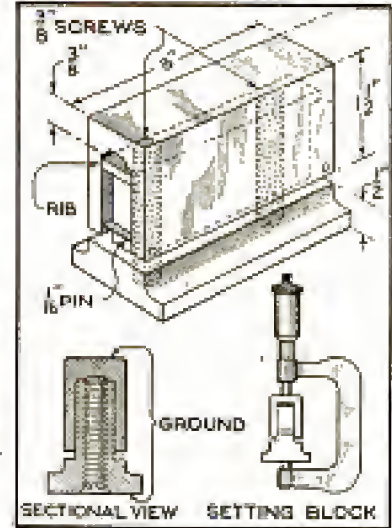
An Adjustable Lathe Dog

The drawing shows a lathe dog that is capable of holding various sizes of work. Merely by releasing the regular binding screw at the top and dropping the lower portion of the dog a notch, larger work can be accommodated. The design is very simple, the parts easily made to suit individual requirements, and considerable time can be saved because a large variety of sizes is not necessary. This dog is driven from a face-plate in the usual manner, the tail being made to fit into the slot in the plate.



Adjustable Parallel Blocks

A very handy and useful parallel block that will save much time, and facilitate setting of work, is made according to the form and dimensions given in the drawing. The vertical adjustment is made by two screws that support the upper member. Such blocks can be used individually, in pairs, or threes, as the job in hand may require, and, by using a micrometer as in the drawing, the blocks are easily set to the same height. The screws should be threaded with a fine S.A.E. thread, which will permit close adjustment. The base of the block is shaped, drilled, and tapped as shown, and notice should be taken of the retaining rib that keeps the two parts of the block from coming apart. The base is wide enough to furnish a good support, and it, as well as the top, is ground to a flat surface. The upper member slips over the tongue of the base and is countersunk for the points of the adjusting screws. A small pin through each end of the upper member catches against the rib and holds the top and base together.



Blocks of different heights, each set overlapping the other in its limits of adjustability, should be made; one set with a 1-in. adjustment, starting with a height of 2 in. and opening out to 3 in., with the next size opening from 3 to 4 in., and so on.

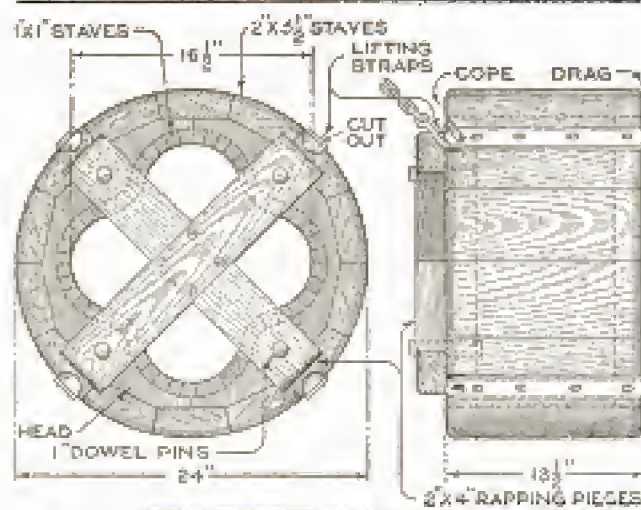
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Gravel in Concrete Mixtures

Most bank-run gravels contain a great deal more sand than is desirable in a concrete mixture. Sometimes this sand is twice as great in quantity as would be best. If about 75 per cent of bank-run gravel were fine material, the proper proportion of cement would vary widely from that required in case only 30 per cent of the gravel were fine material. Only by separating the fine sand from the pebbles can definitely specified concrete mixtures be secured.

Unusual Type of Pattern Construction

It is common practice among pattern-makers to build a cylindrical pattern in segmental courses, in which case it is of



A Method of Building Cylindrical Patterns That Uses Staves Parallel to the Center of the Pattern Instead of Segmental Sections, Makes the Work of the Molder Easier and Prolongs the Life of the Pattern

the utmost importance that the lumber is thoroughly dried and seasoned; that the segments are securely glued and fastened together, and that at least three coats of good varnish are applied to the surfaces of the finished work. If these things are not done carefully, the damp molding sand will loosen the glued joints, causing the segments to warp, twist, and contract or expand, so that the pattern will not be truly cylindrical. This expansion or contraction will cause pockets in the sides of the cylinder, in which one or more segments may overlap slightly. When this occurs, the molder has a troublesome job in extricating the pattern from the sand mold, and the sand that forms the face of the mold is, in many cases, "sheared" away when the pattern is lifted from the mold. A pattern in this condition receives rough treatment at the hands of the molder, as considerable rapping is required to loosen it enough to enable him to extract it from the mold.

The objections above outlined, and others that could also be cited, do not apply to cylindrical patterns of the type shown in the drawing; if they did, very few castings could be produced from it, as it has a rather weak cross section. The pattern is made stave-fashion, with the staves running parallel to the center instead of being built up in segments. The pattern consists of the heads and the outer and inner staves. Contrary to the usual practice of making the heads in

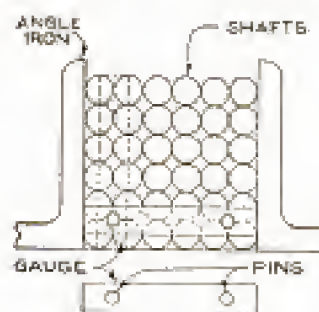
a complete circle and building the staves around them, the heads are made in two pieces that are temporarily held together on a flat board. The body staves are next fitted and fastened to these half heads. The half pattern is now removed from the board, and reinforcing pieces are fastened inside the heads with an overlap at the joints, to which the opposite half of the pattern is fastened. The opposite half heads are put in place and fastened securely with glue and screws. The inside staves are fitted and fastened with glue and finishing nails, and finished with a round-bottom plane to the required shape and dimensions. This is done very simply, if the pattern is laid out and built up correctly. The pattern is now turned and finished in the lathe, sanded, and given three coats of good black varnish. The $\frac{3}{8}$ -in. by $1\frac{1}{4}$ -in. lifting straps are then fastened to the side of the pattern. The straps are made the same length as the pattern and do not project beyond it, and cup-shaped depressions are cut into the wood to permit the insertion of hooks into the holes in the straps.

A novel feature of this mold is the rapping piece, made from two pieces of 2 by 4-in. lumber, fastened at right angles to each other. This piece has a 1-in. dowel pin at each end which fits into holes in the cope head. Instead of the heavy iron bar that is usually driven into the pattern for rapping purposes, the rapping is done on the rapping piece, which is put on after the cope flask has been lifted, and removed after the rapping has been finished.—M. E. Duggan, Kenosha, Wis.

Marking Off Centers on Shafts

When large numbers of short lengths of round stock require to be marked off at the ends, preparatory to center drilling, much time can be saved by the simple set-up shown in the drawing, together with a special marking-off gauge.

Arrange the shafts, after cutting to the proper length, in layers six wide and six deep, between two angle plates bolted down to a drill-press table, or other plane surface. The gauge can be made from any flat stock, but its width must be the exact diameter of the shafts. A pin is driven into each end

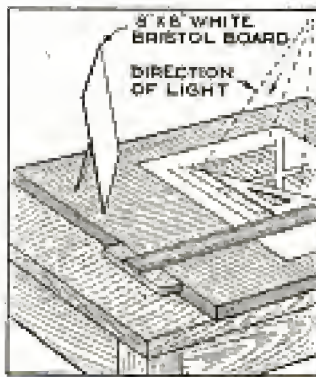


of the gauge, their diameter being such as to make them a snug fit into the spaces formed by the junction of four shafts. The distance apart of these pins is the same distance as the first and last spaces in the rows of stock.

When marking off, place the gauge in a horizontal position, with the pins in the spaces, as indicated in the drawing, and scribe a line along the shafts; this will give the center in one direction. After the lot has been scribed horizontally the gauge is placed in a vertical position and lines are scribed perpendicularly, the intersections of the horizontal and perpendicular lines being the centers of the shafts.

Light Reflector for Drafting

Often the light on a drafting board is poor and the shadows of the triangle and T-square are dense enough to cause eye-strain in detecting



the exactness of the lines to be drawn or traced. Under such conditions it is advisable to use a reflector of the type shown in the drawing. Nothing more than a square of white Bristol board is required, with a

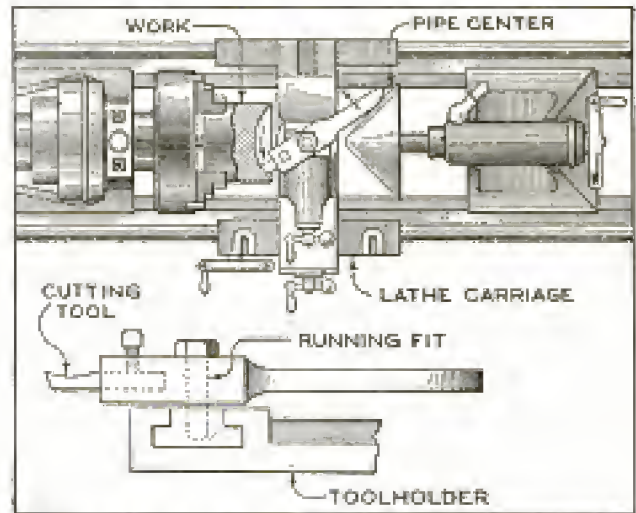
strip of the same material glued to the back to form an easel. By moving the reflector about so that the shadows are illuminated by the reflected light, the strain on the draftsman's eyes will be considerably lessened.—Truman R. Hart, Ashtabula, Ohio.

Galvanizing Brass and Copper

Copper and brass may be coated with metallic zinc in the following manner: Place finely divided zinc in a nonmetallic vessel, and cover it with a concentrated solution of sal ammoniac. This is heated to the boiling point, and the copper or brass articles are introduced. A few minutes in the boiling bath will suffice to produce a firm and brilliant covering over the surface of the work. The zinc can be reduced to the requisite fineness by pouring the melted metal into an iron mortar and pounding it with an iron pestle until the solid mass has been granulated to the desired fineness.

A Simple Radius Tool

The illustration shows a simple and almost automatic arrangement for cutting radii in a lathe. It only requires that the



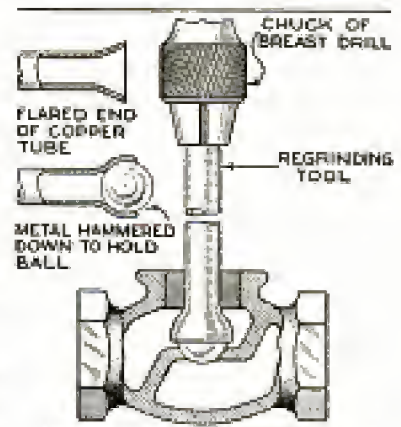
A Simple Radius-Cutting Tool That Is Almost Automatic in Its Operation: The Toolholder Is Pivoted, and a Projecting Tail Bears against the Conical Center

tailstock center be fed forward. The tool bit is held in a holder that is pivoted at its center to the cross slide, in the manner shown. The projecting tail of the holder bears against the pipe center held in the tailstock. Consequently, as the conical center is fed forward, the tool is forced to travel in an arc.—Jos. F. Convery, Worcester, Mass.

Grinding Ball-Check Valve Seats

After a considerable period of use, ball-check valve seats will pit and rust, the valve will leak, and it will be found that the trouble cannot be entirely corrected by the insertion of a new ball into the worn seat. It is a simple matter to regrind

such a check-valve seat by the method illustrated. The end of a piece of copper tubing is flared by driving it over one of the hardened steel or brass balls used. After the end is flared, it is hammered in to hold the ball securely. With this tool, held in the breast drill, and a small amount of valve-grinding compound, the seat of the valve may be quickly reground.



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Drain Pit for Filling Stations

A small pit used for draining crankcases, and placed convenient to the filling station, has proved to be a good investment to a



A Concrete Pit for Automobile-Service Stations Facilitates Drainage of Crankcase Oil. A Five-Inch Molded Rim Prevents Cars from Running over the Edge, and the Pit is Covered with an Iron Grating.

the draining is not charged for. The stations can afford to do the work of draining the crankcases of their customers' cars free, since it results in the sale of several quarts of oil in each instance.

The pits are of concrete, made with a 5-in. molded rim, to prevent cars from running over the edge. An iron grating is always kept handy, and is put over the opening when the pit is not in use, to prevent accidents. By providing filtering facilities, the oil that is drained from the crankcases can be restored to salable condition, and can be sold for the lubrication of farm machinery and similar purposes.

Preventing Loss of Tracings

The chief draftsman in a large shop uses a very effective method of keeping track of tracings taken from the file by draftsmen for reference, alteration, or other purposes. A draftsman taking any tracing is required to leave with the file clerk a receipt in the form of a card 2 in. wide and 3 in. high, which is then filed by number in a tray. When the tracing is returned, the file clerk destroys the card before filing the tracing. This much

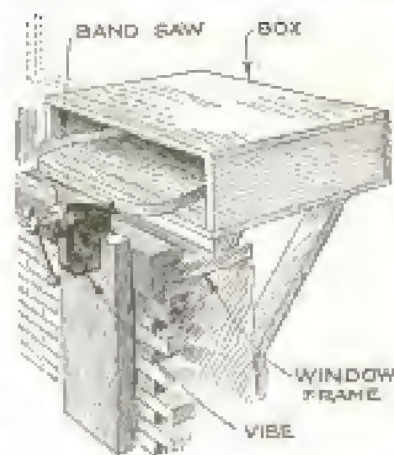
of the procedure is very common. The shop referred to had experienced a great deal of trouble because the draftsmen failed to return valuable tracings, and the receipt cards remained forgotten in the file. To prevent this, all the blank cards are now beveled off at the top; one month, cards are used beveled off toward the right side of the card, and the next month's supply of cards are beveled off toward the left. Toward the end of the month the file clerk goes through the card tray and takes out any cards which show by their bevel that they are remaining from the previous month. He then inquires of the writer of each of these receipts why he has not returned the tracing. If there is a good reason for keeping the tracing so long, the old receipt is destroyed, and a new one written on a card beveled to conform to those for the current month. In this way, the receipt file is brought up to date at the first of each month, and cases of "buried" and forgotten tracings are avoided.

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Window Box Aids in Filing Band Saws

In pattern shops and other places where band-saw blades are filed frequently, the arrangement shown will facilitate the work of setting and filing the teeth, and

keep the saws from getting snarled up on the bench or floor so that there would be—as there generally is in such cases—danger of breakage. A wooden box is permanently



fastened to the outside of a window frame, so that it will clear the sash and not interfere with its operation. The folded saw is inserted in the box, where it is kept coiled throughout the operation. In this manner the saw filer requires but a minimum of room for his work, and he can get his vise as close as possible to the source of light.

¶ In addition to the time-honored expedient of ruling lines for tables on the reverse side of a tracing, this side can be used for inking in temporary details. These can be removed later without affecting the main drawing.



Bicycle Grinding Outfit with Many Original Features

BY JOHN ANSON FORD

BY constructing a particularly ingenious grinding outfit, which is mounted on a bicycle, a westerner has emancipated himself from indoor shop work, and provided himself with a practical means of earning a livelihood in a congenial manner. The equipment is such as any person used to handling tools can make with little or no difficulty.

tact with the rear wheel, when the rear of the bicycle is raised from the ground on the special stand provided for making the outfit stable. The friction wheel is operated by a spring-held lever which holds it firmly against the rubber tire of the rear wheel, and so provides a very satisfactory means of driving the grinding wheel. The stand, or frame, for elevating the rear of the bicycle from the ground and supporting both the outfit and its operator, consists of two rods, about 5 ft. long, which are hinged to a block fastened just underneath the saddle; these are spread out, and their ends thrust into the ground, when the grinding outfit is to be used.



A Tool and Knife-Grinding Outfit Mounted on a Bicycle, the Rear Wheel of Which is Raised by Long Rods: The Upper Photograph Shows the Rods Extended; the Lower Picture Illustrates How the Rods Fold Out of the Way



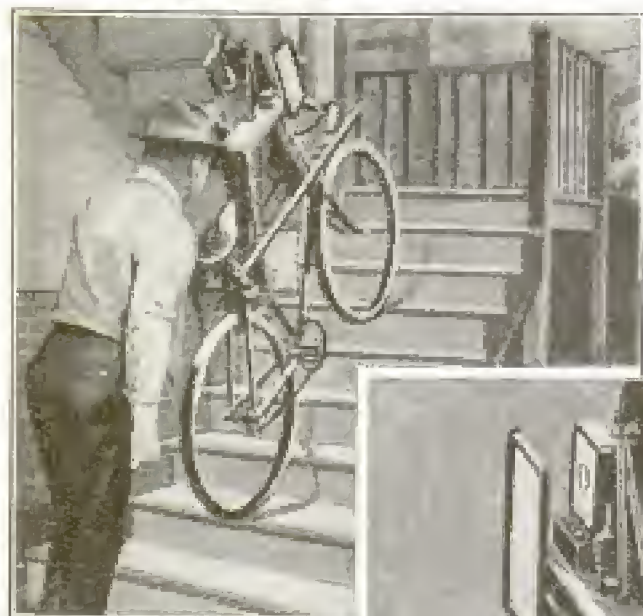
The equipment, as illustrated in the several photographs, is original with the builder, who worked up his own design. It consists of an oak frame that forms a table on which a fine-grained emery wheel, for knife and tool grinding, is mounted. The ordinary arbor of the grinding wheel was removed, and a bicycle hub substituted, to insure even, easy running. A small sprocket on the side of this hub carries a chain, which runs over another sprocket, also mounted on a bicycle hub; this is fitted with a friction wheel, which is brought into con-

tact with the rear wheel, when the rear of the bicycle is raised from the ground on the special stand provided for making the outfit stable. The friction wheel is operated by a spring-held lever which holds it firmly against the rubber tire of the rear wheel, and so provides a very satisfactory means of driving the grinding wheel. The stand, or frame, for elevating the rear of the bicycle from the ground and supporting both the outfit and its operator, consists of two rods, about 5 ft. long, which are hinged to a block fastened just underneath the saddle; these are spread out, and their ends thrust into the ground, when the grinding outfit is to be used.

To each side of the machine two chains are fastened, one to the rear of the frame, at the hub, and the other at the upper end of the front fork. When the supporting rods have been put into position, the chains are stretched taut to the lower ends and fastened there by hooks, thus forming a rigid support.

The manner in which this important feature of the device folds up parallel to

the frame, without interfering with the operator when he is traveling, is shown in the second photograph.



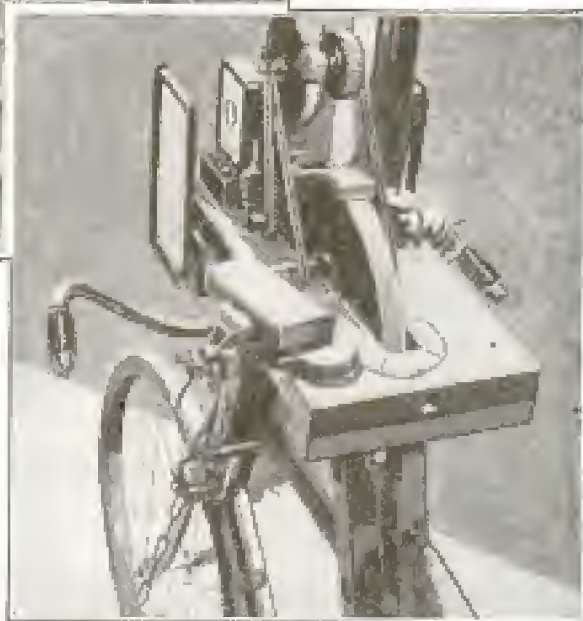
A Counterweight and Pulley, Fastened to the Porch, Makes It Easy to Move the Outfit Up and Down Steps. The Lower Picture Shows the Complete Equipment as Mounted on the Wheel.

Much ingenuity has been displayed in designing the various accessories, which include a buffer and scratch brush, mounted on a third bicycle hub, upon which, at its center, a friction wheel is mounted. By means of an adjustable frame, which is clearly shown in the lower photograph on this page, these wheels can be brought down to

make contact with the grinding wheel, so that polishing and cleaning can be done without the operator changing his position. A level is mounted on the table to enable the owner to set up his machine accurately, while a small vise, pivoted to one corner of the stand, is used to hold a fine-grained oilstone. When not in use, the vise is swung around out of the way. Convenient holders are provided on the table for two socket wrenches and an oil-can, other tools being carried in a case attached just underneath the water can, which is provided with a petcock to drip water onto the grinding wheel.

The whole outfit cost its maker about \$45, and two months of his spare time to complete. The total weight of the wheel and its attachment is about 80 lb., and while this is a rather heavy wheel, it has not been found hard to manage, except when carrying the outfit up and down stairs to the room in which it is kept. To overcome this difficulty a counterweight and pulley have been rigged up

in the corner of the porch. When the rope fastened to the counterweight is hooked at the front of the bicycle, it is a very easy matter to move the outfit up or down the steps.

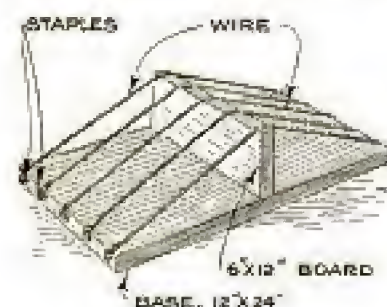


A Wire Boot Scraper

A most efficient boot scraper can be made from two boards and a few feet of strong wire. A T-shaped support is made

by nailing the two boards at right angles to each other. The upper edge of the perpendicular board is notched to keep the several wires from shifting

their positions. One end of each wire is fastened to one end of the horizontal board with staples, the wires being then



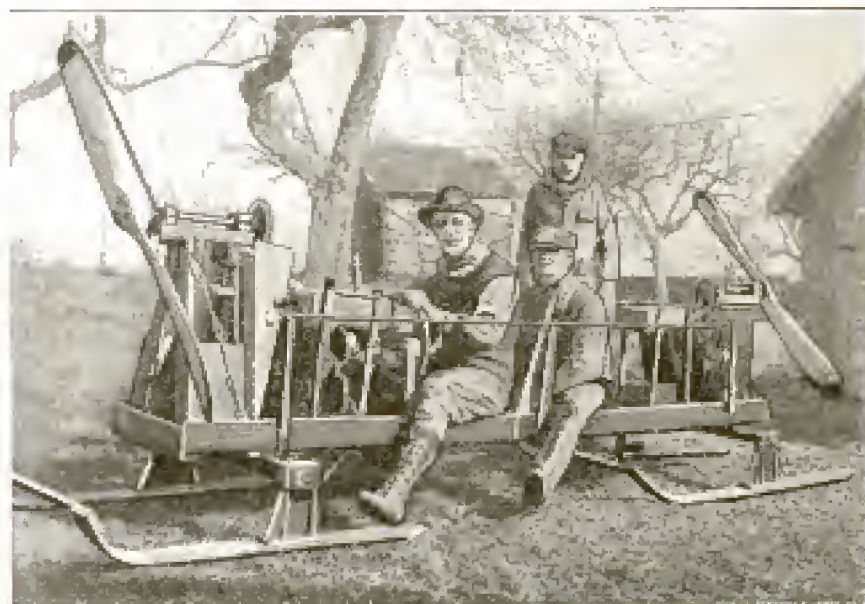
drawn up tightly across the vertical support and made fast with staples to the opposite end of the base. When the foot is drawn across the taut wires, the mud is scraped off and falls onto the base.

Cleaning Furnaces

In cleaning out furnaces of the pipeless or hot-air types, an automobile-speedometer shaft, about 6 ft. long, can be used to reach parts of the furnace, such as the radiator, that are inaccessible to the usual cleaning tools. A brush is attached to one end and a round can fastened a short distance behind it. In use, the arrangement, brush first, is pushed around the smoke flues, the brush dislodging the soot and dust and the can collecting and removing it.

A Powerful Aero Sled

Something a little different from the usual type of air-propelled sled—one that uses two propellers instead of one—is shown in the photograph. This particular vehicle uses both "pusher" and tractor propellers and is designed for use on hard-packed snow or ice. Two motors, one for each propeller, of the ordinary twin-cylinder motorcycle type are used, the motors being bolted to the frame of the sled. Brackets support the countershaft bearings and give the proper clearance to the blades. One end of each countershaft is bolted to the propeller, and sprocket wheels are keyed to the opposite ends, as the propellers are both driven from the motors by sprockets and chains. The speed of both motors can be controlled by a single lever within easy reach of the driver, and separate fuel tanks are provided for each engine. The frame of this aero sled is made from two spruce sticks, about 12 ft. long, with ash crosspieces. The runners are made like skis, and have steel shoes underneath to prevent skidding.



A Powerful Aero Sled That Uses Fore and Aft Propellers, Driven by Separate Engines of the Twin-Cylinder Motorcycle Type

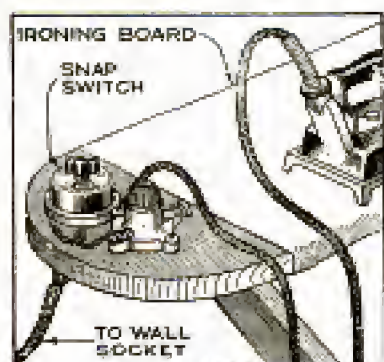
The front propeller is 5½ ft. in diameter, and the rear one is 4 ft. 10 in. The forward propeller is geared to run at about 1,100 r.p.m., while the one aft turns at

from 1,300 to 1,400 r.p.m., so that even though it is in the air stream of the forward propeller it will take a good grip on the air.

This sled is very strongly built and has great speed, with a passenger capacity of three. Wire guys, fitted with turnbuckles, are used throughout the entire structure to keep the frame and mechanism rigid.—C. S. Greene, New York, N. Y.

Indicating Switch for Electric Irons

In order to prevent wear on the electric-iron plugs, and at the same time have some convenient means of controlling the



current as well as knowing when the "juice" is turned on or off, an indicating snap switch and keyless porcelain socket may be permanently fastened to the ironing board. Connection is made to the source of current by means of a suitable length of cord with a plug, which is attached to the snap switch on the ironing board. This arrangement makes it unnecessary to pull the plug from the

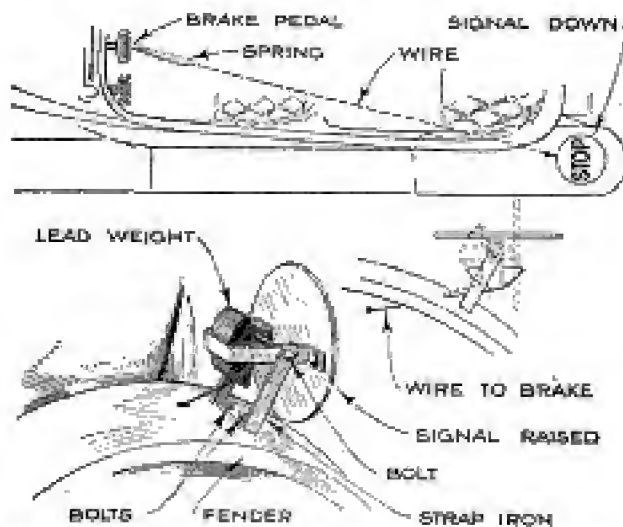
iron, and besides, the cord hangs down from the board instead of being in the way, as it is when connected to an overhead lamp.—K. L. Martin, Cleveland, Ohio.

Cotter Pin Aids in Tube Repairs

When a tire is punctured and the inner tube deflated, it is necessary to pump up the tube to locate the hole. When the hole is located, the air is let out through the valve so that the tube can be cemented and patched. A simpler way than removing the inside of the valve or depressing it, is to insert a cotter pin into the puncture. The ends of the cotter pin are spread apart to distend the sides of the hole, and it is then an easy matter to force the air through the enlarged opening. Also, the application of a little patching cement to the inside edges of the hole makes a better job, and with the cotter pin holding the hole open, this is easy to do.

A Simple Rear Signal

The "stop" signal illustrated is designed to be attached to the left rear fender of the car. It is connected to the service-



An Automatically Operated Warning to the Car Behind That the Driver Intends to Stop or Slow Down is Operated by Pressure on the Service-Brake Pedal. Normally the Warning "Stop" is Not Displayed

brake pedal so that the slightest forward movement of the pedal will swing the circular target to a perpendicular position and display its warning. The sheet-metal disk is provided with a weight, which is attached to it by a bracket, as indicated in the drawing. Another bracket is bolted to the fender to support the weighted disk. Normally, the weight will keep the disk in a horizontal position, and operation of the brake pedal is required to make the device show its warning; this is accomplished by means of a wire, running from the weight to the brake pedal. To compensate for wear of the brake bands, which allows the pedal to move forward a greater distance, a coil spring is attached, as indicated. A signal of this character is of special value to truck drivers, where the rear view is obstructed by the body.

Electric Iron Used as Vulcanizer

Tube vulcanizing is expensive, and often a new tube is discarded because of a single blowout that is too large to be covered with a cold patch. To be sure, there are various types of vulcanizers that are to be had for a small sum, but as a rule they are mussy and inefficient, often ruining the tube beyond repair, and with small gasoline vulcanizers, there is the added danger of fire.

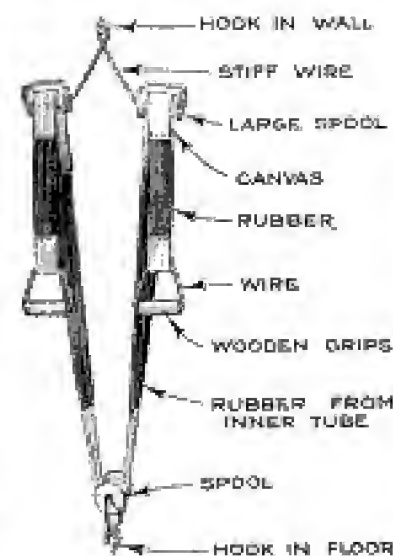
A safe and reliable vulcanizer that covers a large area can be made by removing the handle from an electric flatiron and

using it as the heating unit. Inner tubes can then be vulcanized anywhere that current is available. A repair can be made very close to the valve without removing it, and any size of hole can be mended by making one or more settings of the iron. It is advisable to try out the vulcanizer on an old tube first. In making a repair, always powder the patch with soapstone, or French talc, and lay a piece of paper over it before applying the vulcanizer. This will prevent the hot iron from sticking to the tube.

A short piece of iron, with holes bored in one end, screwed on in place of the handle, will make the removal of the hot iron an easy matter. In use, the electric-iron vulcanizer is clamped to the tube with one or more ordinary C-clamps.—Glen F. Stilwell, Collinsville, Ill.

A Homemade Exercising Machine

Old inner tubes, and some stiff wire or iron rod, together with three large spools, are the materials used for making a home



exerciser at insignificant expense.

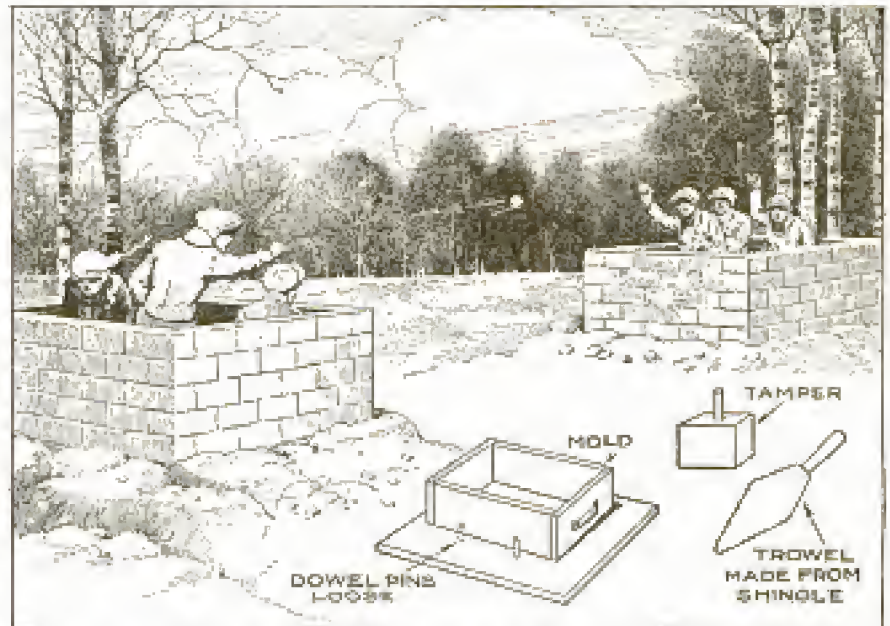
The rubber is cut into strips, 2 in. wide and of the length desired, two or more of the strips being cemented to each other, as may be desirable. Where the bands pass over the spools, canvas is used instead of rubber, on account of the wear. The pieces of canvas are sewed along the edges and turned inside out to make a flat tube the same width as the rubber bands. The ends of the rubber strips are covered with rubber cement on both sides, inserted into the canvas, and weighted down until thoroughly dry. The arrangement of strips, spools, and hooks is clearly shown in the drawing.

Any discoloring matter in water will stain a water gauge glass and make it difficult to see the water level. When it becomes necessary to clean the glass use hydrochloric or muriatic acid.

Making Snow Building Blocks

Forts, Eskimo igloos, and other buildings can be made quite elaborate architectural accomplishments if constructed of snow building blocks. The snow is compressed in a simple rectangular wooden mold, which produces a block about the same size as the standard concrete block, or 8 by 8 by 16 in., although any other size or shape may be produced by altering the mold. The mold is placed on a flat surface, filled with snow that is tamped down hard, and the snow struck off level with the mold top. After the snow has been sufficiently compacted, the mold is removed, and the block is set aside until a sufficient number have been made to complete a fort or other structure. In building, the blocks are held to-

gether by a "mortar" of wet snow or slush, which, when frozen, unites the building into one solid mass. The trowel used for spreading the mortar can be

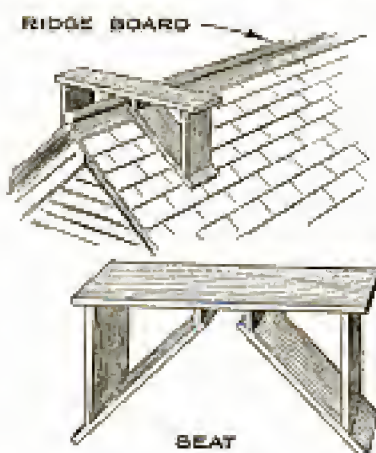


Forts Erected with Building Blocks Made of Snow: The Blocks are Molded in a Wooden Form and Then Laid in a Mortar of Wet Snow, Which, When Frozen, Unites the Building into One Solid Mass

made from a shingle or piece of board.—John L. Dougherty, Toledo, Ohio.

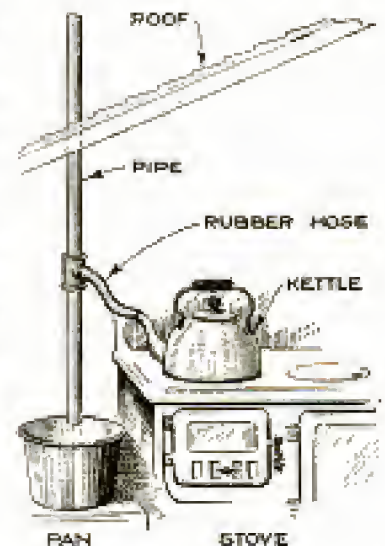
Comfortable Ridgepole Seat

The drawing illustrates a device that can be used to equal advantage by carpenters and others doing work on the ridge of a roof. The seat is made from a board 2 ft. long, which is supported in a horizontal position by braces at each side. Naturally, the length of the perpendicular supports will vary more or less to correspond to the pitch of the roof. A seat of this type can be moved forward or backward while the worker is sitting on it, and the fatigue caused by assuming uncomfortable positions is thus obviated. Such a seat is also a safety device for the worker, that will materially reduce the possibility of accident either to himself, or to those below from falling tools.—Augustus C. Hausman, New Haven, Conn.



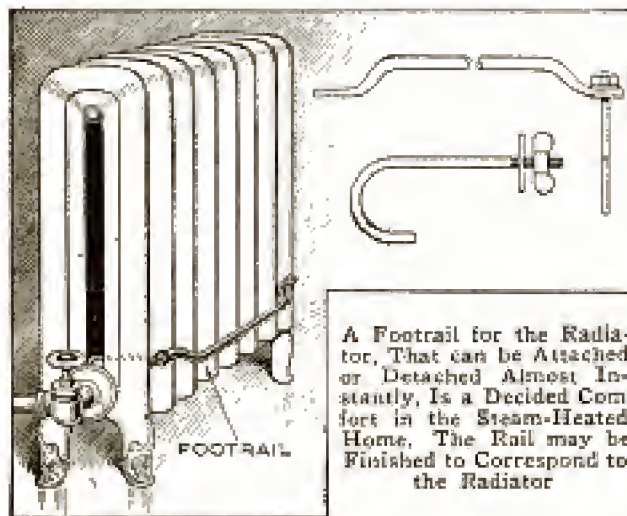
Making Alkaline Water Drinkable

Settlers in parts where the water is alkaline find it difficult to get water that is fit to drink, as it must be distilled or otherwise purified. The illustration shows an easily made condenser that is often used for this purpose, consisting of nothing more complicated than a length of iron pipe provided with a tee in the center, and passing through the roof of the house. The spout of a teakettle is connected to the tee by a short length of hose. When the water in the kettle boils the steam will issue into the iron pipe where it will condense into drops on the inside, the distilled water dripping into a pan.



A Footrail for the Radiator

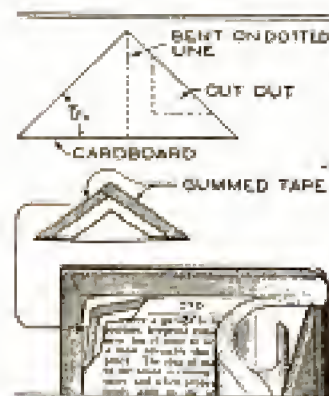
A quickly detachable footrail that can be used on any type of radiator, can be made from a piece of $\frac{1}{2}$ -in. pipe or iron



rod, although the former will probably be found to be stiffer. A piece of pipe of suitable length is bent to the form shown, and the ends are flattened and drilled to take the threaded ends of hooks made of iron rod. These hooks, or clamps, are hooked over the inner part of the radiator between the sections. The threaded ends are inserted in the holes provided in the ends of the rail, which is held rigid by the application of washers and wingnuts.—B. Francis Dashiell, Dunkirk, Md.

Practical Bookmarkers

A bookmark that is free from the many objections of most types and that slips over a corner of the page is very simply made. Cut a square of rather thin



cardboard, about 2 in. on a side; cut along one diagonal, and place the resulting two triangles together. Now cut two 2-in. pieces of gummed tape and use them to fasten the short edges of the paper triangles together. Finally, cut a small notch in the middle of the long edge of one of the triangles and fit the completed bookmark over the corner of a stiff card, to clear out any paste or gum that might remain between the two triangles.

To use this bookmark attach it over the corner of the left-hand page of the book on the upper side of the leaf. Do not try to catch more than one leaf in the bookmark, for it will then be sure to come loose when the book is opened. It is a good idea to see that the notched side of the marker always indicates the side where the "place" in the book is.—Curtis Ralston, Springfield, Ohio.

Transferring Printed Pictures

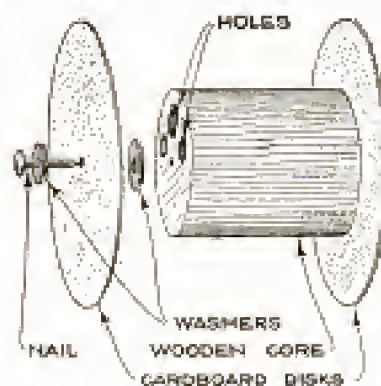
This method may be used for transferring the pictures printed in papers and magazines to paper and fabric for various purposes.

Dissolve a bar of common soap in 1 gal. of hot water and add $\frac{1}{2}$ pt. of turpentine. Allow the mixture to stand overnight, stir well, and bottle, after which it is ready for use.

The solution is applied to the face of the picture it is desired to transfer, with a brush or tuft of cotton. A piece of clean cloth or paper is laid over the picture and firmly rubbed with the bowl of a teaspoon, or a similar smooth article.

The Eccentric Spool

A very simple toy will interest the young folks because of its eccentric



conduct and movements when rolled, and because of the unusual principle involved. All that is required is two heavy cardboard disks, and a section of curtain pole about $1\frac{3}{8}$ in. in diameter. One disk is permanently tacked to the end of the wooden core, while the other is attached so as to revolve freely. Three holes, one $\frac{1}{2}$ in. in diameter and two $\frac{1}{4}$ in. in diameter, are drilled all the way through the wood parallel to the center. A washer is provided on each side of the revolving disk to prevent it from binding; this and the holes drilled through the crosspiece are responsible for the unexpected spins and turns that the spool automatically performs when rolled. A very slight push makes it do this; a hard one will send it rolling in a straight line.



EVERY snowflake has an infinity of beauty which is enhanced by the knowledge that the investigator will, in all probability, never find another exactly like it. Consequently, photographing these transient forms of Nature gives to the worker something of the spirit of a discoverer. Besides combining her greatest skill and artistry in the production of snowflakes, Nature generously fashions the most beautiful specimens on a very thin plane so that they are specially adapted for photomicrographical study.

The photographing of snowflakes, although quite delicate work, can hardly be called difficult, although some hardships attend it, because the work must all be done in a temperature below freezing, and under conditions of much physical exposure. The temperature at which photography is possible depends somewhat upon the thickness of the crystals; this varies greatly from time to time, and depends upon whether the temperature is rising from an intense degree of cold or falling from a point above freezing. If rising after a cold snap, photographing can often be continued until actual thawing commences.

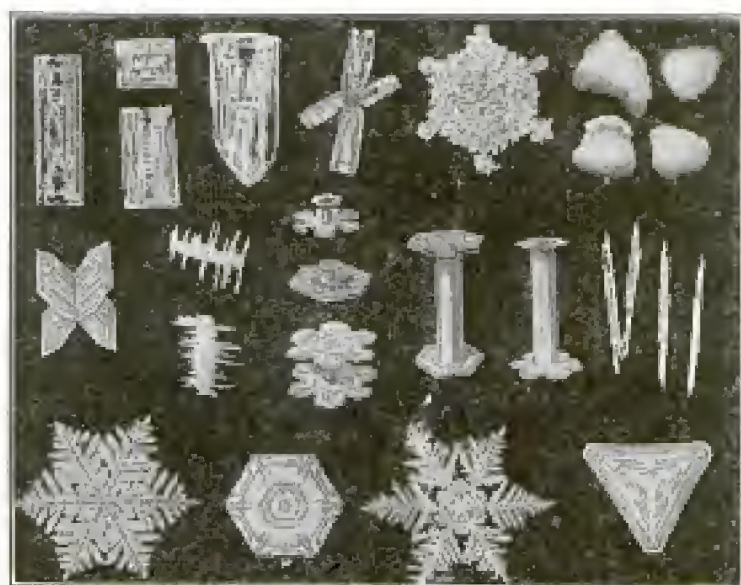
Of course, location is everything in this work, and no one except those living in arctic climates or in regions having long and severe winters, can accomplish very much. Generally speaking, the western quadrants of widespread storms or blizzards furnish the most beautiful and perfect forms. At such times the wind is usually westerly or northerly, with the

barometer standing at 29.6 to 29.9 in. and slowing rising. The percentage of perfect crystals is likely to be larger when the snowfall is not too thick and heavy, with the crystals medium to small in size rather than large. The character of the snowfall often undergoes quite abrupt changes as a storm progresses.

The apparatus required for snowflake photography consists of a compound microscope, fitted with a joint that permits the instrument to be turned down horizontally, at right angles to its base,

so that it can be coupled to a camera bellows by means of a light-tight connection. The microscope objectives are used alone, without the eyepiece. It is best to have several different objectives; $\frac{1}{2}$, $\frac{3}{4}$, and 3-in. combinations, which give magnifications of from 8 to 60 diameters (64 to 3,600 times), will serve well.

Ordinary daylight, coming through a window, is used for illuminating the crystal after it has been placed on a microscope slide, a tiny beam of light entering through the small aperture in the substage of the instrument. The apparatus is placed indoors, near by and facing a window. The room, the apparatus, and its accessories should always be away from any source of artificial heat, and at a temperature approximately that of the outside air. The necessary accessories are an observation microscope, a pair of thick mittens, microscope slides, a sharp-pointed wooden splint, a feather, and a turkey wing or similar cluster; also, an extra focusing back for the camera, con-



A Variety of Strange Forms of Snow Crystals: The Specimens near the Center Are of the Most Interest on Account of Their Rarity

taining clear glass instead of the usual ground glass, with a magnifying lens attached; this is used for final focusing. A blackboard, about 1 ft. square, with stiff wire or metal handles at the ends, so that the hands will not touch and warm it, is used to collect the specimens. As it is necessary to cover the end of the microscope objective with a strip of black card, that takes the place of the usual



Blocking Out the Snow-Crystal Images on the Photographic Negative: Right, Original Negative; Center, Negative Partly Blocked Out; Left, Completely Blocked-Out Negative

camera shutter which controls the duration of exposure, it is necessary to fit two vertical rods at each side of the microscope tube to hold the card.

The snowflakes are caught on the blackboard as they fall, and examined by the naked eye or with the assistance of a hand magnifying glass. The feather duster is used to brush the board clean every few seconds, until two or more promising specimens alight upon it, when it is immediately removed indoors. From this point onward the photographer must work fast. The promising specimens are placed for a moment's observation under the observation microscope. The removal of the snowflake from the board to the microscope slide is accomplished with the sharp-pointed splint, which is pressed gently against the face of the crystal until

the latter adheres to it, so that it can be picked up and placed on the glass slide. Usually several crystals are placed together on a single slide, a momentary glance being given to each, and care taken while doing this not to breathe on the crystals. The utmost haste must be used, for a snow crystal is often exceedingly tiny, and frequently not thicker than heavy paper. Furthermore, once these bits of pure beauty are isolated, evaporation (not melting) soon wears them away, so that, even in zero weather, they last but a very few minutes. When a desirable specimen is obtained, it is pressed flat against the glass with the edge of the feather and the slide inserted in the stage of the microscope on the camera stand, centered, roughly focused with the camera ground glass, then sharply focused with the clear-glass screen and magnifier, focusing on some tiny air tube near the center of the crystal. The plate holder is then inserted into the camera, the objective covered with the black card and the slide removed from the plate holder. The objective is then uncovered, and when the exposure, which may vary from 8 seconds to 100 or more, is deemed sufficient, the operation is reversed. Naturally enough, no rule for the length of exposure can be given, except that the greater the magnification, the longer the exposure should be.

The frail, feathery flakes are the most difficult to photograph, and it is always best to place five or six other crystals around the specimen, as this greatly retards the evaporation of the central one.

When working from the rear of the camera, and the bellows extension is such as to make it impossible to reach the focusing screw on the microscope, an arrangement similar to that shown in the page illustration can be used. This consists of a cord that runs over a wheel on each side of the camera and around the focusing screw. No lens is required in the camera, the microscope furnishing the optical equipment for projecting the images onto the sensitized plates.

Having recorded the fleeting substance of the snowflakes on the photographic negative and brought out the image by development, the photographer discovers that the body of the snow crystal is so transparent, that it does not contrast enough with its background to make a print in which the form will stand out in relief. There is no purely photographic method for producing the white images against a dark background, and yet it is necessary to do so if the images are to be



The Apparatus Used for Photographing Snowflakes and Some of the Specimens Selected. Above: The Author Holding the Tray on Which the Snowflakes are Collected. Center: A Cord That Passes over the Microscope Focusing Screw and Wheels at Each Side of the Camera Makes Sharp Focusing Possible. Below: Inserting the Transparent-Glass Microscope Slide, on the Surface of Which Is One or More Snowflakes, into the Microscope Stage, Preparatory to Photographing

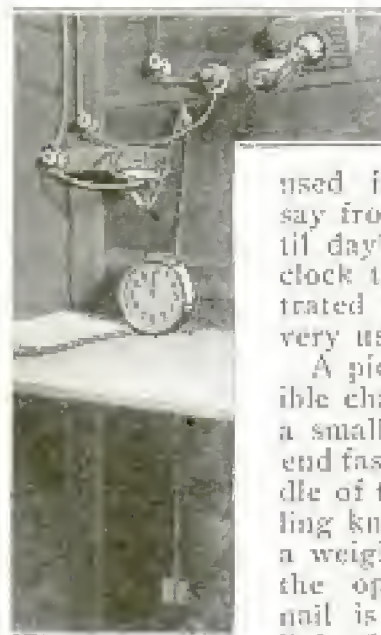
appreciated by most people, whose ideal of snow is that of immaculate whiteness. The only effective method of accomplishing this result is what is known among photographers as "blocking out."

The negative is supported on an ordinary retoucher's desk, which may be merely a piece of glass, arranged to hold the negative so that the image is illuminated by transmitted light. Then, with an etching knife or other fine, sharp-pointed tool, the operator proceeds to scrape away the emulsion around the outline of the crystal to leave it standing

alone against a background of clear glass. This requires considerable patience, and often considerable time as well. In order to avoid irreparably spoiling the original negative, it is best not to alter it in any way, but to make a copy negative on which the actual blocking out is done. After the negative has been thus prepared, prints or lantern slides are made in the usual manner. Blocking out the negatives is done indoors, instead of outdoors as shown by the photograph, which was thus taken to get sufficient light to allow the exposure to be made.

Alarm Clock Turns on Electric Lights

The use of artificial light in poultry houses has become quite popular, as, by increasing the number of hours of light,



the hens have more time for feeding, and lay more eggs. Where electric lights are used in the morning, say from 4:00 a. m. until daylight, the alarm-clock time switch illustrated will be found very useful.

A piece of light, flexible chain, passing over a small pulley, has one end fastened to the handle of the light-controlling knife switch, while a weight is attached to the opposite end. A nail is run through a link of the chain, about level with the alarm-wind key of the clock. One end of this nail is supported on a small block immediately behind the clock and the other rests on the alarm key of the clock, after it has been wound. This arrangement holds the chain and weight, and provides for enough slack chain to leave the switch open. When the alarm goes off at the time set, the alarm key turns and allows the nail to slide off; the weight drops down and closes the switch.

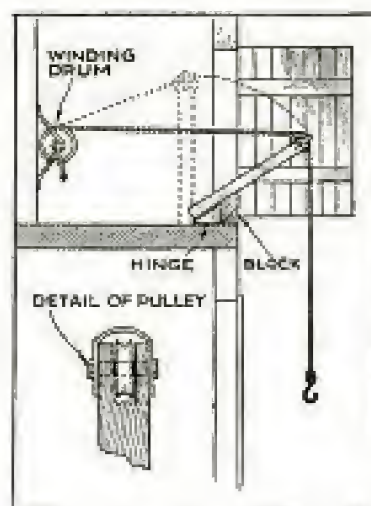
Cleaning Plowshares

To keep plowshares and moldboards, as well as cultivator shovels, from rusting during the time they are laid up, it is best to give them a liberal coating of some thick grease. If the grease hardens on

the surface so that its removal is difficult when the implement is to be used, a small amount of gasoline or kerosene may be poured over the share, and ignited just before the plow is to be used. The heat, together with the solvent action of the gasoline, will soften the grease, and if the plow is started in the ground while the grease is still warm, the coating will peel off easily and completely. A handful of dry hay or grass ignited under the plowshare will answer in the absence of gasoline. Either of these methods is better than scraping the grease off.

A Simple Farm Hoist

A simple hoist that will find many uses about the farm, for raising bags of grain and other bulky weights to the upper floor of a barn or other building, is shown in the drawing.



A wooden beam, of suitable thickness and length, is hinged to the floor at a convenient point inside the door or other opening. The upper end of the

beam is provided with a single-sheave pulley, over which the rope passes to the winding drum; this can be easily improvised. A wooden block can be made and inserted underneath the projecting beam so that the arm is held in an inclined position, as shown. The packages are raised clear of the building and, when they reach the pulley, swing inward as the arm rises to a vertical position.

Increasing Tone of Phonograph

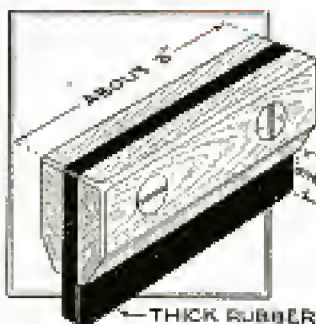
"Extra-loud" phonograph needles are furnished that have a comparatively blunt point so that none of the amplitude of the vibrations is lost as in the long and tapering "soft-tone" needles. When it is desired to obtain a still greater volume of sound, these extra-loud needles can be shortened by breaking off about one-third of the needle at the blunt end. This is done by holding the needle in two pairs of pliers and bending it. The needles are hardened and will break easily. The shortened needle is secured in the reproducer and permitted to protrude just enough to allow the other parts of the reproducer to clear the record. The greatest possible volume of sound is then obtained from the records for playing dance music or piano records.—Chas. I Reid, Millersburg, Pa.

Cheap Soot Removers

To clean out stovepipes and furnace flues of an accumulation of soot without trouble or muss, is entirely possible by the use of common materials. Metallic zinc is one of these soot-removing agents, and it can be used in any form, such as old tops from fruit jars, old washboard coverings, dry-cell cases, and the like. In the case of the last-named, a particularly pleasing effect is obtained when an old dry cell is dropped into the flames of an open fire, which produces a delightful play of colored light. A handful or two of salt thrown into the furnace is also good for removing accumulations of soot.—Cora Hamilton, Binghamton, N. Y.

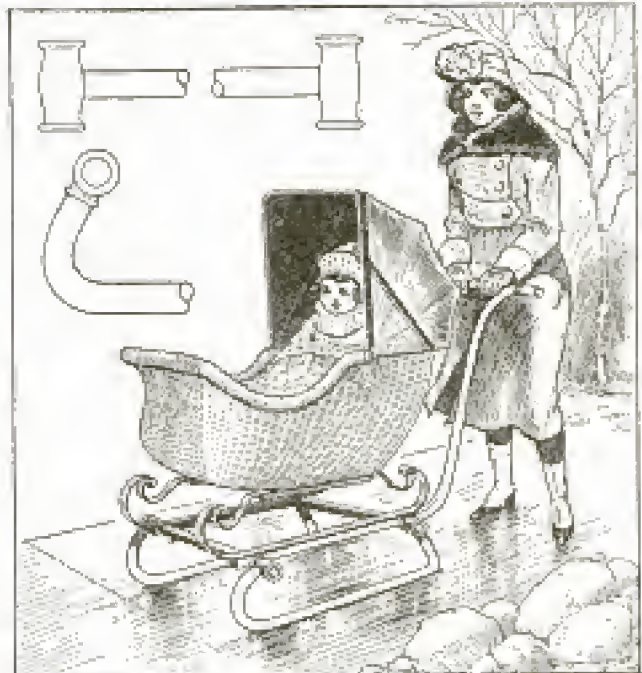
Scraper for Dinner Plates

A little convenience for the kitchen that will save a considerable amount of labor is the easily made scraper shown in the drawing. A sheet of thick rubber is clamped between two hardwood blocks of the proper dimensions with ordinary screws. One or two passes of such a scraper over a dish cleans off practically all grease and other remains much more quickly and effectively than is possible by the use of a knife or similar implement.



Sled Runners for the Baby Carriage

Four pipe tees, and suitable lengths of pipe, bent upward at the ends, are the only materials required for a set of de-



A Pair of Gas-Pipe Runners for the Baby Carriage Makes It Almost Instantly Convertible into a Sleigh for Snowy Weather. It Is Only Necessary to Remove the Wheels and Slip the Runners over the Axles

tachable runners by means of which the baby carriage can be converted into a sleigh in a few minutes.

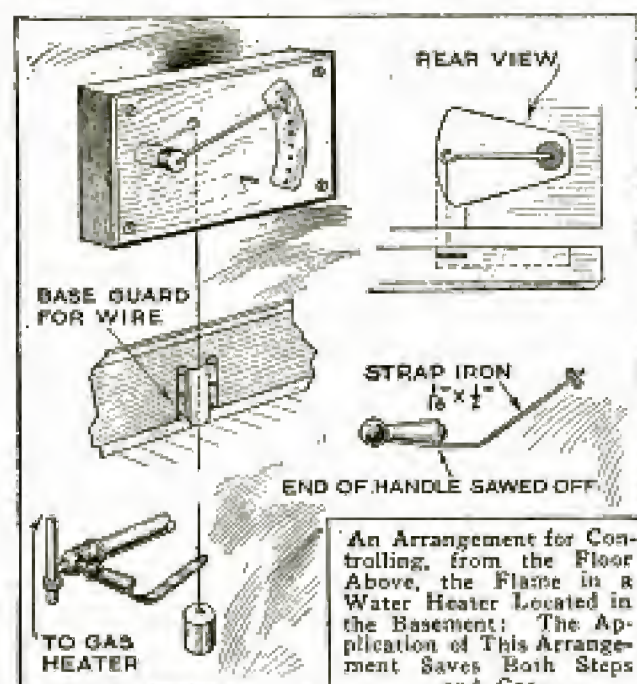
To attach or detach the runners, it is only necessary to remove the nuts and washers that hold the wheels, slip on the runners and replace the nuts, although in some cases it is possible that larger washers will be needed on each side of the tee, to hold the runners rigid when the nut is turned down. If some form of catch is employed instead of nuts to hold the wheels, it may be necessary to cut a groove in the inner ends of the tees to take the catch. This is easily done, however, and will not worry the amateur mechanic. The size of the tees used, and, therefore, the pipe size, will be determined by the diameter of the axles.—Clare B. Smith, Chicago, Ill.

Stiff Collars Made into Soft Ones

Most stiff linen collars are discarded at the slightest sign of wear, although in this condition they can be made to give weeks of extra use by converting them into soft collars. This is done by boiling out all the starch, making neat repairs where needed, with silk thread, and laundering in the usual manner for unstarched work.—S. S. Sutherland, Detroit, Mich.

Step-Saving Water-Heater Control

The water-heater regulator illustrated is one that has resulted in saving many steps between the first floor and basement



of a residence, and that has also effected a saving in the amount of gas consumed. The construction of the regulator is simple, and involves nothing that cannot be made by the home mechanic. An extension is attached to the gas-cock handle, as indicated, and this is connected by a wire to the controlling arrangement on the upper floor. The controller consists of a U-shaped wire lever mounted on a wooden block attached to the wall. One end of the lever is bent at right angles, and its position is adjusted and maintained by inserting this projection into holes drilled in a metal plate and into the block. A weight is attached to the underside of the valve-handle extension, so that should the wire break, or the lever become loose, the gas will be turned off automatically.—Donald W. Clark, Buffalo, N. Y.

A Hint for the Auto Painting Job

When the automobile is given a coat of paint at home, the most important thing is to keep dust from settling on the paint before it has dried. The old finish should be sandpapered and carefully wiped off, to make the surface as smooth as possible and remove all dust and dirt. Before applying the paint, tack paper over all cracks and crevices in the garage that might let in dust from the outside;

then, if an especially dust-free job is desired, make a frame of light lath, big enough to stand on the floor and cover the car and at the same time leave room to work. Cover this frame with thin paper—light will come through the paper but dust will not. Save a new brush and an unopened can of varnish for the finishing coat on the body and fenders, and when the painting job is completed, do the finishing work under the covered frame.—J. Paul Suter, Youngstown, Ohio.

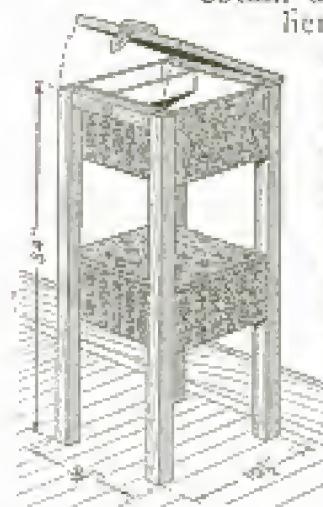
Removing Wire Wheels

Owing to a puncture, it was found necessary to remove one of the wire wheels on a new automobile that had been driven only a few hundred miles. The nuts on the wheels had been set up very tight, and it was found impossible to unscrew them by simply pulling on the spanner wrench, with the wheel jacked up. The nut was finally unscrewed by the following method:

The jack was removed and the spanner set on the nut so that its handle was horizontal; then the jack was set under the end of the handle. By "pumping" on the jack, the end of the handle was raised slowly, while the wheel revolved, slipping over the road surface. By proceeding in this manner, the nut was loosened sufficiently to enable it to be entirely unscrewed without difficulty by turning the spanner by hand.

An Easily Made Sewing Stand

The sewing stand shown in the drawing is the outcome of a woman's inability to obtain an article suitable to



her requirements. It is made from two wooden cocoa-packing cases of the same size. After the outside of the boxes had been covered with cretonne glued to the wood, hinged lids were provided and similarly covered.

The wooden legs are about 1-in. square, and are fastened to the boxes from the inside, with screws.

The top section is provided with a neat brass hasp so that it can be locked.—T. H. Lynn, Hyattsville, Maryland.

Cleaning Ceilings

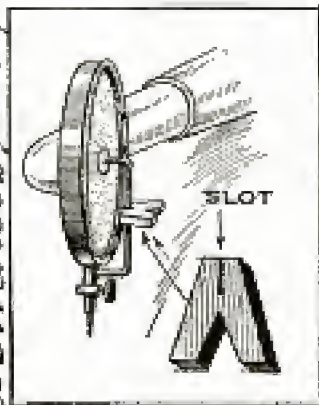
To clean smoke, dirt, grease, fly specks, etc., from a painted ceiling or wall, make a mixture of vinegar, baking soda, and a little table salt, and rub the grimed surface with it. Follow by washing off with warm water and soap, and wipe dry, using a soft rag. This method is also good for enameled baths, glass, and white porcelain.

Test for Water in Gasoline

Water will "lick" molasses off a stick, gasoline will not; and water, being heavier than gasoline, sinks to the bottom of a tank. On these principles a simple test for water in gasoline has been evolved by a state inspector. A stick is coated with molasses and plunged into a gasoline tank. If there is water present it will show up as a bare section on the gauge when withdrawn, the length of the bare wood indicating the depth of water. —Hjalmer Lindquist, Minneapolis, Minn.

Softening Tone of Phonograph

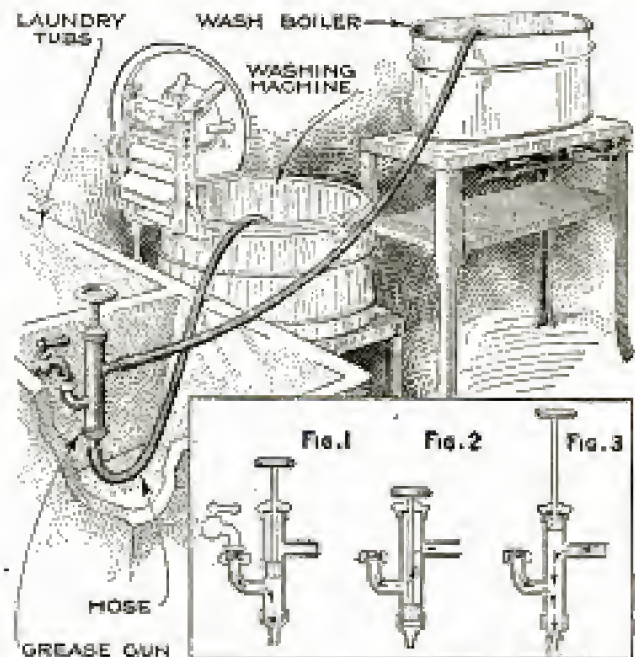
The attachment shown in the drawing is cut from a piece of thick sheet rubber, leather, or similar flexible material, in the form shown, and fitted over the needle bar of the phonograph reproducer to subdue the tone of the instrument. In applying or removing the "mute," for such it properly can be called, the ends are pressed together by the fingers; this expands the slot in the opposite side and makes its application or removal very simple.



Laundry Siphon Made from Grease Gun

A washing machine or boiler can be filled or emptied easily and without dipping the water by means of the novel siphon shown in the drawing. An ordinary grease gun was obtained and elbow and hose connections were brazed to the side of the cylinder. The siphon is screwed to the laundry-tub faucet, and, with the piston in the position shown in Fig. 1, the water flows through the nozzle at the bottom and may be con-

ducted into any receptacle, or used, with the hose removed, for filling the stationary tub. With the piston in the position indicated in Fig. 2, the water flows



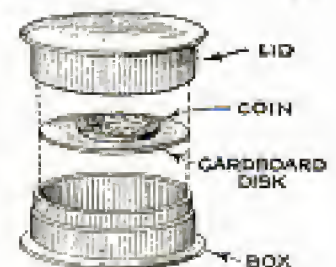
By Brazing a Hose Connection and Nipple to the Cylinder of an Ordinary Grease Gun, a Laundry Accessory is Produced That will Drain or Fill the Washing Machine, Boiler, or Other Vessels

through the upper tube. To drain the washing machine or boiler, it is only necessary to raise the piston to the position shown in Fig. 3 and turn on the water, which will suck the dirty water out into the stationary tub. —J. G. Brown, Evanston, Ill.

The Magic Pill Box

The magic pill box makes coins disappear and return at will; the trick is very simple, and any pill box can be fixed for performing it in a few minutes.

Get a regulation round pill box, and cut a cardboard disk just large enough to fit into the bottom. Drop a coin in the box and put the lid on; then, turn it upside down and shake it, calling attention to the fact that the coin is still there, by the rattling inside. Now, pull the box apart, holding the lid in the left hand, so that the cardboard disk covers the coin, which has vanished. Then, still holding the lid upside down, put them together again and reverse the operation, holding the bottom in the right hand; upon opening the box the coin will reappear.



A Small-Lathe Countershaft

By J. V. ROMIG

INSTALLING a small bench lathe in the shop of the experimenter or model maker, has caused many an amateur me-

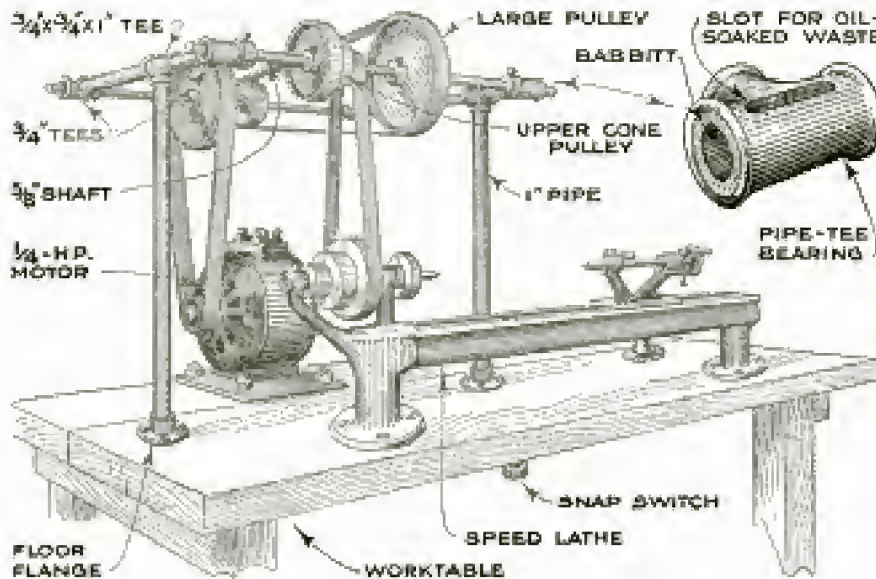
Both ends of the tee are dammed to prevent the melted metal from flowing out; this may be done by fitting a cardboard disk over the shaft, against the end of the tee, and holding it in place with putty, or with a metal collar screwed against the tee. The opposite end is similarly dammed. A lip-shaped opening must be provided at the highest point of the dam for pouring the metal. If properly made, such bearings will require but very little aftertreatment to obtain a true-running bearing. The countershaft and its pipe standards are assembled, as shown in the drawing, with collars against the bearings to prevent end play.

For small lathes up to 6-in. swing, a 1/4-hp. electric motor is perhaps the most satisfactory source of power, and this is bolted to the bench, back of the headstock. A snap switch of suitable capacity can be mounted at a convenient location underneath the bench, for controlling the operation of the motor. If it should be undesirable, for any reason, to have the countershaft mounted on the top of the bench, several modifications of this arrangement are possible, and will suggest themselves to the builder. The same idea can be carried out by inverting the arrangement and bolting it to the underside of the bench, or to the floor under the bench, cutting slots on each side of the headstock and bringing up the belts from underneath.

Aid for Feminine Motorists

When motoring in a brisk breeze, many women are bothered by the problem of preventing the skirts of light and thin dresses from blowing up. With both hands occupied it is impossible for the feminine driver to keep tucking her skirts under her.

A clever girl conceived the idea of taking an ordinary paper clip and fastening the front and back hems of her skirt together after she had seated herself in the car. Thus, her limbs are left free to manipulate the foot pedals and her hands



Setting Up a Small Bench Lathe in the Experimenter's Shop is Accomplished without the Use of an Overhead Countershaft. The Countershaft is Supported on an Easily Made Standard and Bearings Made of Iron Pipe and Fittings

chanic to lie awake nights figuring how to avoid overhead countershafts, with their attendant long belts, particularly when the lathe is to be operated by a small electric motor. A system that has been satisfactorily used for several such installations eliminates entirely the countershaft fastened to the ceiling, and substitutes for it an easily constructed and economical arrangement made of iron pipe, and secured to the bench as shown in the drawing.

Two lengths of 1-in. pipe of the proper length form standards for supporting the countershaft; one end of each is fitted with a floor flange, the other with a 3/4 by 3/4 by 1-in. tee. Pipe nipples of the proper length are screwed into the tees, and a 3/4-in. tee is screwed onto each end of the T-shaped assembly of pipe and fittings; these latter tees are lined with babbitt for shaft bearings.

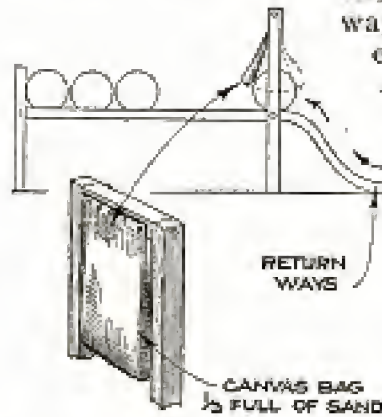
Slots are cut in each of the bearing tees and plugged with pieces of wood, which must reach to the shaft before the babbitt metal is poured; the blocks are later removed, and the resulting slot is packed with oil-soaked waste.

In pouring the babbitt bearings, the shaft is inserted into the tees and blocked up so that it will be central. The shaft is wrapped with a single thickness of paper to prevent sticking after the metal cools.

can be kept where they belong—on the steering wheel. The slight weight of the clip, added to the fact that the front of the skirt is fastened to the back part, which does not sag down so far in the car, helps to hold the skirt easily, and there is no sense of weight or restriction of movement.—Ethel Van Cise, San Diego, Calif.

Retarder for Bowling Balls

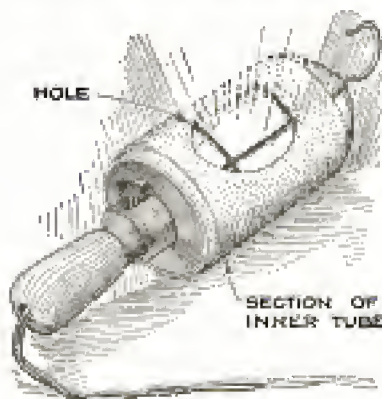
To prevent bowling balls from coming together too hard when they reach the end of the return ways, thereby shortening their life and making an unnecessary amount of noise, the proprietor of a set of alleys rigged up the retarder shown in the drawing.



Two upright pieces, connected by a crosspiece, were fastened to the sides of the ways, and from the crosspiece a canvas bag, about a third filled with sand, was suspended in such a manner that the bottom was in line with the center of the ball. The velocity of the ball is reduced when passing underneath the bag to such an extent that it rolls into place easily and almost noiselessly.—Geo. A. Volz, Monroe, Mich.

Shade for a Trouble Lamp

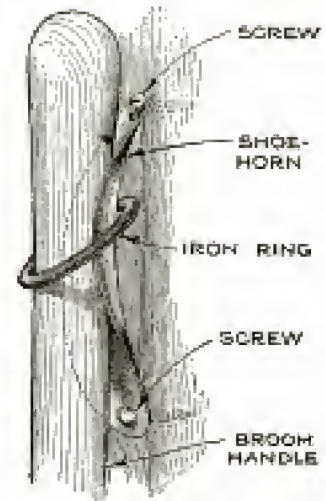
To shade a trouble lamp that is protected from damage by a wire guard, a suitable piece of an old inner tube that has a hole cut in one side and pulled over the guard, as shown in the drawing, will serve very well. The hole can be cut to permit the passage of as



much light as desired without having it shining into the workman's eyes. Besides serving as a shade, the rubber is also an additional protection for the bulb.

Broom Holder Made from Shoehorn

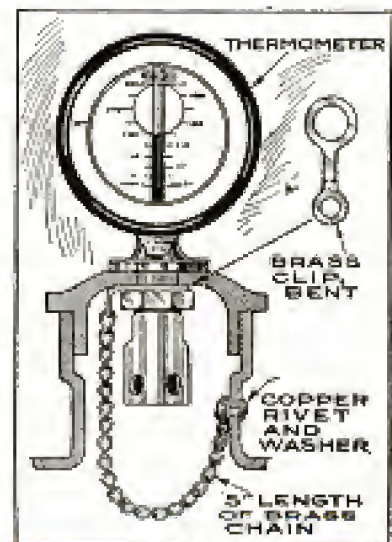
An iron ring, such as is commonly known as a harness ring, and an ordinary shoehorn can be converted into a very satisfactory holder for brooms, mops, and similar round-handled articles. As shown in the drawing, this particular form of holder is simplicity itself; the ring is slipped over the small end of the shoehorn, both ends of which are then fastened to the wall with screws. Roughening the inside of the ring will improve its grip on the handle of the broom.—M. H. Bolsinger, Johnstown, Pa.



Locking the Radiator Cap

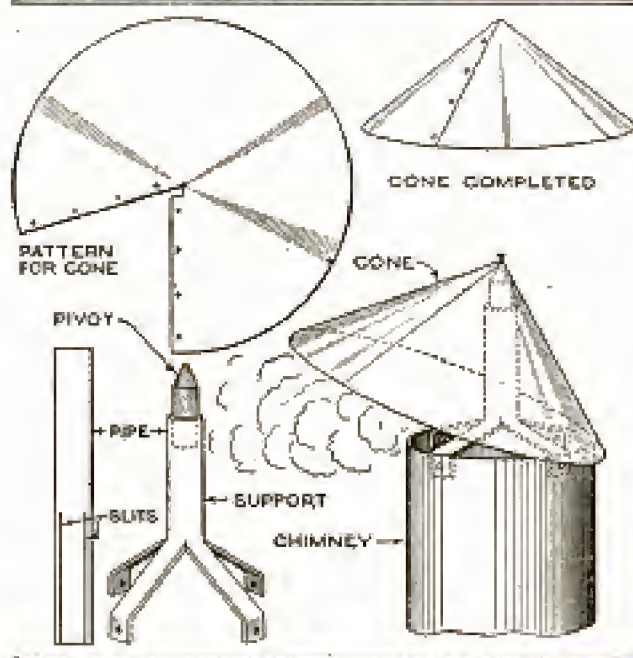
Radiator caps of automobiles that are fitted with thermometers for registering the temperature of the cooling system, and for giving warning of overheating, are expensive enough to attract the attention of the "doormat" type of thief.

A simple protective measure consists in attaching a short length of light brass chain to the instrument and the radiator-filler tube, in such a way that the cap can be unscrewed for filling the radiator, but cannot be dropped or carried away. A brass clip is cut to the form shown and screwed underneath the nut that holds the thermometer to the radiator cap. One end of the chain is fastened to this clip, and the other is riveted to the neck of the radiator. While it is possible to cut the chain with a pair of wire-cutting pliers, the thief, finding the cap secured, will more than likely seek easier booty.



A Simple Stovepipe Cap

The chimneys of most summer kitchens are mere stovepipe extensions beyond the roof or walls of the building,



A Simple Cap for a Stovepipe Chimney That Not Only Increases the Draft and Prevents Water from Entering but Keeps the Stove from Smoking

and should be provided with rain caps, to prevent water from entering and causing them to rust rapidly. Stationary caps, while suitable for the purpose, cause the stove to smoke more or less in windy weather. Of course the location of the building in relation to surrounding structures has much to do with smoking chimneys and imperfect draft. However, the simple wind and rain deflector illustrated will insure against such annoyances.

A piece of 1-in. pipe, about 8 in. long, and a 12 by 12-in. sheet of heavy tin or galvanized iron, with a few stove bolts, or rivets, are the only materials required. The pipe is slit with a hacksaw to a depth of 4 in., as shown, and the four quarter sections thus made are bent at an angle to the remaining section, the bent part being heated to make the work easier and prevent breaking. The ends of the projections are turned down 1 in. from the end and drilled to take suitable bolts or rivets, as indicated. A wooden plug is driven tightly into the upper end of the pipe and tapered off as indicated. The standard thus made is bolted or riveted to the stovepipe.

The conical cap is cut from the piece of sheet metal provided, the edges being drawn together and riveted or soldered,

and the completed cone is placed on the pivot and held in place by a nail driven into the wooden plug.

The slightest wind will operate the cap, causing it to tilt against the windward side of the pipe, so that the draft is increased and back drafts prevented.

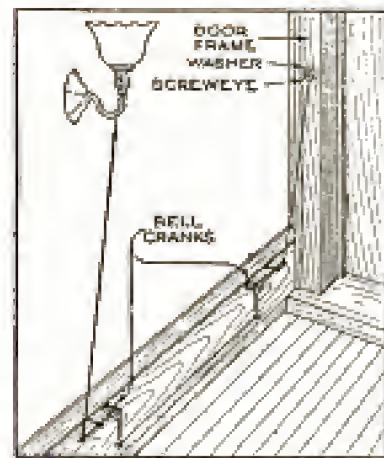
Identification Mark on Tires

An aluminum slip on which the name of the owner is stamped can be placed in the mold when a section is being vulcanized into a tire, and provides a means for permanently marking the tire with the name of the owner pressed into the rubber. Nameplates of the type in question are produced by slot machines more or less generally located in public places and amusement resorts, and cost only a few cents. If desired, the name of the repairman can be used.

When the tire is ready for vulcanizing, the nameplate is placed in the mold, face out, and then the tire. The nameplate can be used indefinitely, and the same idea can be applied to a number of different methods of marking and identifying tires.

Extension for Pull Chains

An inconveniently placed electric light can be quickly changed to be the most convenient in the whole house by using the idea illustrated, or some variation of it.



Two bell cranks, having 2½-in. arms, are fastened to the baseboard, and connected to each other and the pull chain of the lamp socket by means of a cord. Another cord is run up through a screw eye on the door frame, and a washer tied to the end of the string to keep it from falling through. A small washer behind each of the bell cranks prevents them from binding against the wall.

Before this extension pull chain was installed, it was necessary to walk around the bed in order to operate the light, but with the extension, the light can be turned on from the doorway.

Muting a Banjo

In the rendition of some selections, or under circumstances where the loud tone of a banjo is more or less objectionable, the instrument can easily be muted to give a more subdued tone. All that is necessary is two five-cent pieces; these are interposed between the ends of the bridge and head of the instrument.

How to Build an Adjustable Bridging Condenser

An adjustable bridging condenser for wireless work, that will serve as well as the high-priced manufactured articles on the market, can be built easily and economically. It will work in the ground lead in C. W. transmission sets, but when used for this purpose, the mica should be of the best quality, and all units, when clamped together, should be tested out with 500 volts of direct current before installation. This condenser works nicely in receiving sets, and can be made in various capacities, which are cut into and out of the circuit by the fan switch.

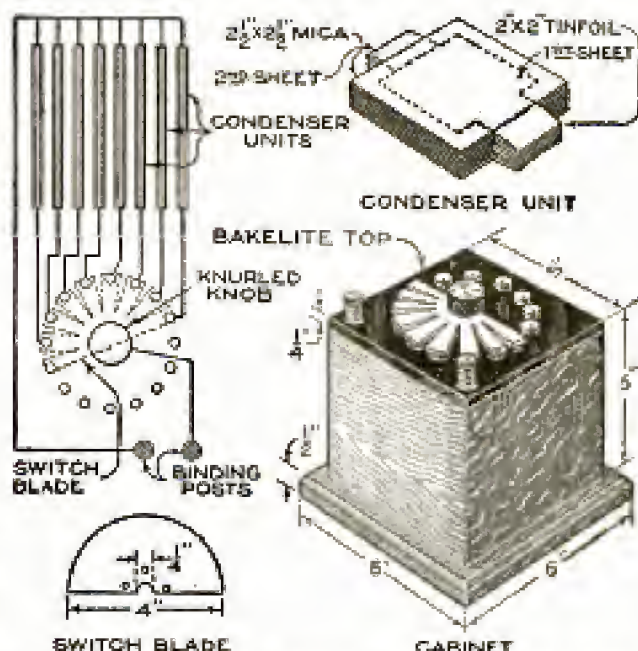
The eight condenser units are made up of 2-in. squares of tinfoil, clamped between $2\frac{1}{2}$ -in. square mica sheets. Make one unit with five sheets of foil and the remaining seven with three sheets of foil each. The foil sheets are cut out with a tab at one edge which projects beyond the mica plates.

In assembling the first unit, a mica sheet is laid on the table, a tinfoil sheet placed on it with the tab projecting to the right, another mica sheet placed on top, and the next tinfoil sheet placed with the tab pointing to the left, and so on until the five sheets of foil and six sheets of mica are assembled. The remaining units are assembled in the same manner, the tabs of the alternate sheets being brought out at opposite sides.

After assembling each unit, bind it with electrician's tape, or bolt the whole number of units together between metal plates and impregnate with paraffin. The foil tabs are all brought together at the ends and a lead wire soldered to each, the whole being bridged at the back, as shown, and the leads brought out to contacts in the bakelite top of the cabinet; 16 points are used, eight of these are idle or dead taps, and merely serve to carry the switch blade smoothly. The switch blade is formed from sheet aluminum and screwed to the underside of the switch knob. If sheet aluminum is not to be had, use one of the fixed plates of an ordi-

nary variable condenser, and saw out the radial teeth, as shown. The five-sheet unit is connected to the first point, shown at the left in the wiring diagram.

The cabinet is made from $\frac{1}{4}$ -in. stock to the dimensions given, and the lead

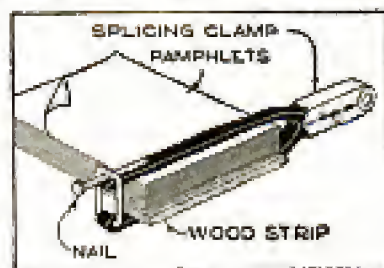


An Efficient Bridging Condenser That can Easily be Built at Low Cost and That will Work Well in the Ground Lead of Continuous-Wave Sets; It Works Nicely in Receiving Sets and can be Made in Various Capacities

wires are brought to binding posts in the top. The cabinet should be finished to correspond to the finish of the other instruments. This condenser can also be back-mounted on the panel, instead of making it into a separate unit, if so desired.—F. L. Brittin, Chicago, Ill.

Clamp for Bookbinding

In casting about for a clamp to hold a number of loose pamphlets that were to be bound together in the form of a book, a pair of lineman's wire connectors was found to be just the thing. The connectors



were a little wide between the handles for the thickness of the number of pamphlets, so a wooden strip was placed against one handle. The pamphlets were evenly placed and the other handle brought down and the clamp link sprung over the end. As the link did not hold the pamphlets together tightly, a nail was inserted, as shown, and the binding cloth applied.

Making Bearings for Model Machinery

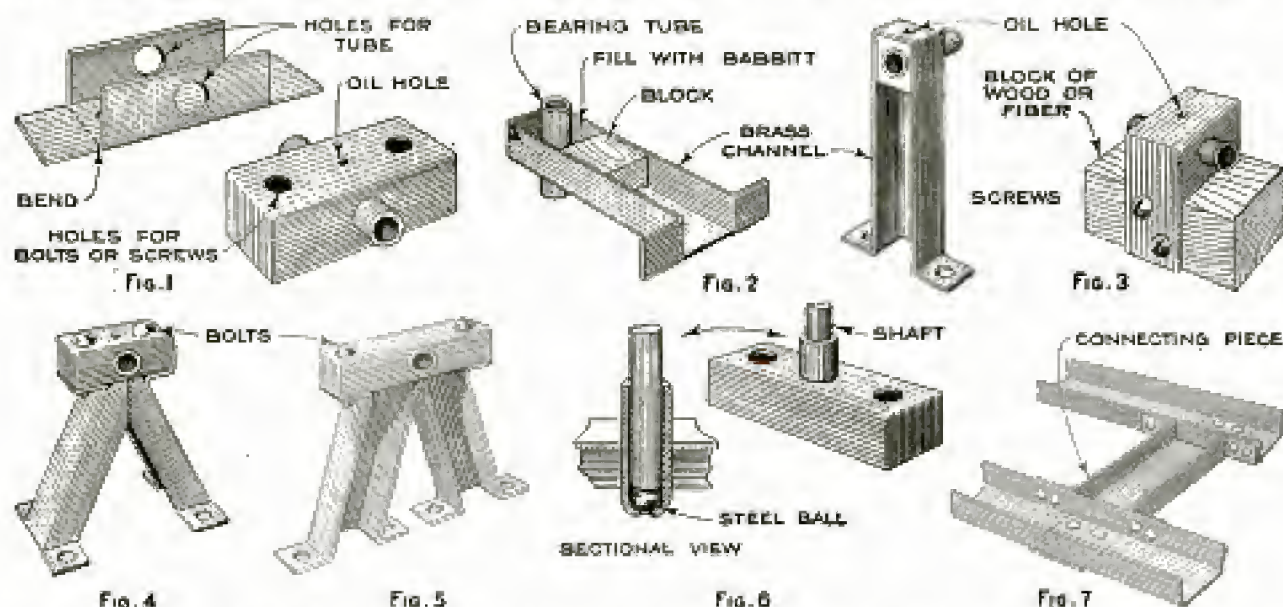
By HOWARD GREENE

THE weak point of much model machinery is in the bearings, which are frequently made of pieces of sheet metal with holes drilled for the shafts. Brass channel-bar stock is much better for this work and is susceptible of a variety of treatment; it is much easier to work with than solid bar stock, as well as lighter and cheaper.

To make a plain bearing, as shown in Fig. 1, cut a piece of the channel to the length of the box, plus twice the height, or a little more, to allow for finishing up. Cut away the flanges at both ends for a distance equal to the height of the box, and bend the remaining strip at each end

If extra rigidity is needed, the bearing may have three feet, instead of two, by bending out the web instead of cutting it off. If desired, the hole for the shaft may be drilled through the babbitt filling, omitting the tube entirely. Another method of making a high bearing is to proceed as in Fig. 1, but the projecting parts of the web are made longer and run down the sides of a neat block of wood, or fiber, as shown in Fig. 3.

Quite an elaborate type of bearing is made as shown in Fig. 4. Two pieces of channel are cut and feet are formed as indicated; a single foot can be made from the web, if extreme rigidity is not an es-



The Bearings in Model Machinery Are Frequently the Weak Points. Brass Channel Bar Is Extremely Useful for Making Bearings That Are a Distinct Addition to the Appearance, Rigidity, and Durability of the Model. Figure 7 Shows How Pieces of the Channel Bar are Riveted Together

over until the ends are closed. For the actual bearing, a piece of brass tube of the right size is forced into the holes through the flanges, as shown. Leave the tube somewhat longer than the width of the box to improve the appearance.

Figure 2 shows a high bearing. Cut away the central part of a piece of the channel, called the web, and bend the flanges outward to form feet, then drill them for the holding-down screws. At the desired height drill for a bearing tube and force the tube in. The top of the channel is to be closed by cutting away the flanges for the necessary distance and bending over the web; then insert a wooden block in the channel, a little below the tube, and fill the space between the top and block with melted lead, babbitt, or type metal. File off the end of the tube flush with the webs on either side.

sential. The bearing itself may be of the type shown in Fig. 1. A variation of this construction is shown in Fig. 5, and this, in many ways, makes a better job, as far as rigidity is concerned.

A thrust, or bottom, bearing for a vertical shaft is made as shown in Fig. 6. A piece of channel is prepared as for the bearing in Fig. 1, but is drilled through the tube through the web instead of through the flanges. Before inserting the tube, one end of it is partly closed by turning over the edge, to hold a steel ball as large as the tube will accommodate. Put the tube in the channel, with the ball end flush with the edges of the flanges, and fill in the channel with babbitt, or solder the tube in place. The end of the shaft should be made perfectly square. If a lathe is available, chuck the shaft, perfectly true, and form a rounded end to

bear against the ball, to secure the minimum of friction.

While channel stock is under discussion, it may be well to indicate a good way of attaching two pieces together. The connecting piece is split on the corners and the flanges are bent outward at

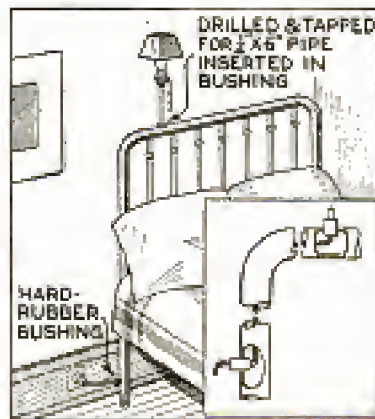
right angles, the web being left straight. The flanges and webs are riveted to the parts to be connected with small brass rivets as in Fig. 7. Incidentally, the small brass nails known to the hardware trade as "escutcheon pins" make excellent rivets for such light work.

Testing Height of Electrolyte

The electrolyte in storage batteries must be kept at a uniform height above the plates at all times for the most efficient operation; if the electrolyte is below a certain level, distilled water must be added to bring it up again. To determine when the cell is filled to the usual height of $\frac{1}{2}$ in. above the plates while the battery is in position, and where the light is poor, a piece of glass tubing, about 8 in. long, can be used. The tube is inserted into the cell until it presses against the plates and the first finger is placed over the upper end. Holding the finger over the end of the tube, the latter is withdrawn, and the level of the solution held in it will indicate the depth to which the electrolyte covers the plates.

A Convenient Bed Light

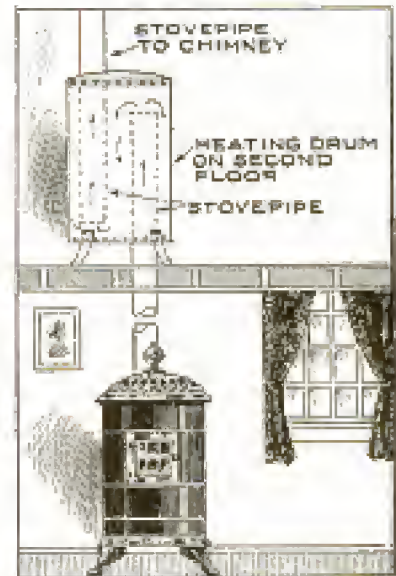
For the comfort of invalids, or those addicted to reading or writing in bed, the bed light shown in the drawing was devised. The actual installation is quite simple and consists in leading the electric-light wire through the tubular bedpost in the manner shown. A



hole is drilled and tapped near the foot of one of the posts and fitted with an insulating bushing for the wire, which is passed through the post and out of a similar hole in the top of the bedstead. The latter hole is drilled and tapped for a bushing, into which a suitable length of $\frac{1}{4}$ -in. pipe is screwed to form a support for the lamp. The outer end of the pipe is threaded and an ordinary chain-pull light socket is attached and wired. A plug on the end of the wires to the lamp is screwed into a flush-plug receptacle.—Truman R. Hart, Ashtabula, Ohio.

Heater Made from Old Tank

The illustration shows how a discarded steel tank was put into service for heating a room on the second floor of a dwelling. Four legs were riveted to the tank and a hole was cut into each end just large enough to admit a stovepipe.



The bottom stovepipe conducted the heat and smoke into the tank from the stove below, the pipe being inserted to within a few inches of the top. The smoke escaped through the second stovepipe which was inserted through the hole in the top of the tank, as indicated.

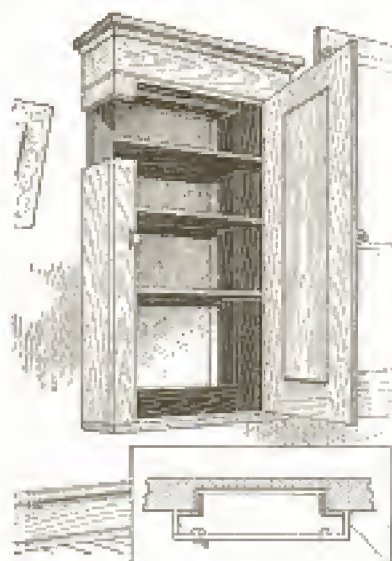
Pipe Coils in Hot-Air Furnaces

The installation of a few coils of pipe in heating furnaces, to provide hot water, is quite common, but many are finding that the running in of the pipe into the firepot at the side of the dome, or heated surface, and out again to the water heater is more or less dangerous unless a tee connection is made on the lower pipe as it leaves the furnace, and a faucet screwed into the outer end of the tee.

The use of the faucet will eliminate all the common troubles of this method of heating water. The coil is bound to clog up more or less during the summer months, and when heated continually it is only a short time before serious damage will be done to the whole furnace. The faucet will permit frequent draining, and as these heating coils are usually of small-diameter pipe, cleaning is often an absolute necessity if the system is to work at all.—L. H. Georger, Buffalo, N. Y.

Enlarging a Shallow Cupboard

A shallow cupboard, built into the partition separating two rooms, was enlarged



to more than double its former capacity by the simple method illustrated, the finished work forming a distinct addition to the furniture of the room. In carrying out the work, none of the original cupboard framing was removed with the exception of the door,

which was made to do service in the remodeled job without alteration. The new woodwork was fastened directly to the edges of the original woodwork, as shown in the plan view, thus increasing the width and height as well as the depth of the cupboard.—Philip Myers, Baltimore, Maryland.

Lamp Made from Artillery Shell

A soldier of the World War cherishes an 18-lb. artillery shell as a souvenir of his experiences, and this he has converted into the good-looking table lamp shown by the photograph. A hole was drilled through the nose and this was tapped to receive the supporting standard and lamp cluster. The base upon which the shell rests was turned from a piece of black walnut and appropriately finished.—Edgar Downie, College Point, N. Y.



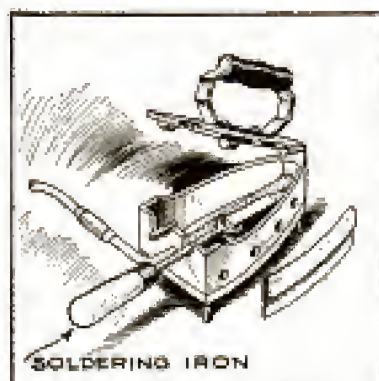
Sandpaper Used for Bushings

The following method of repairing a push-bit pipe, the joint of which had become worn and loose, proved very satisfactory. A small strip of sandpaper was cut to the proper size, and placed in the stem end of the pipe bowl, with the rough or sand surface out. The stem

or bit was then fitted in, and as the thickness of the sandpaper made the bushing too thick, the stem was filed to fit. The rough surface of the sandpaper will prevent the bushing from coming out when the bit is removed for cleaning. Sandpaper bushings can be used for many purposes, such as repairing loose chair legs and the like.—R. B. Clifton, Denver, Colo.

Gas Iron as Heater for Soldering Bit

The drawing shows the manner in which I use an ordinary gas iron to heat a soldering bit. The fact that the iron is so used does not interfere with its service in the laundry. Therefore, either



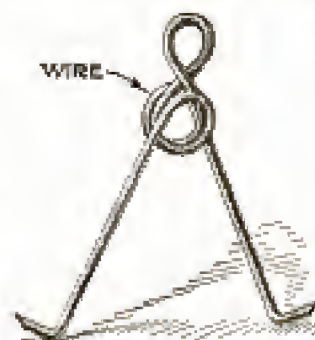
an old or a new iron may be used.

By turning the pipe to which the gas hose is connected to one side, the flame is forced directly onto the soldering iron. To help keep the heat in the

gas iron, it is best to make two side-pieces similar to those shown; these are slipped over the sides and cover the air holes. If the openings in the back of the iron are too small to admit the tang of the soldering bit, it may be necessary to enlarge the hole a trifle by filing.—H. A. Gustafson, Chicago, Ill.

A Simple Skinning Gambrel

For suspending the carcasses of small animals while removing the pelts, some form of gambrel is necessary. The drawing illustrates an original form of skinning gambrel which will not allow the carcass to slip during the skinning, with possible damage to the skin from unlooked-for contact with the sharp edge of the skinning knife. About 3 ft. of steel or brass wire is required to make such an article, which is easily formed by twisting around a stick or piece of tubing, bending the ends, and pointing.



End. S. R. Writers 792 District Washington
National Bank May 1922

Aeronautics
7800 Prizes

PRIZE OFFERS

TROPHY FOR AIRPLANE EFFICIENCY

The last day of the aviation meeting held in connection with the International Aero Congress, at Omaha, November 4, and 5, last year, witnessed the contest for the aerial-efficiency trophy, donated by John M. Larsen. The conditions governing the contest might be specified broadly as the demonstration of the air-going machine that is capable of carrying the heaviest load, at the highest average speed, with the lowest fuel consumption. There were 18 entrants in the contest, and the winner was officially declared to be Earle F. White, who was accorded 4,671 points, as compared with 4,640 points, the score of Max Goodenough, who was second with a Larsen airplane. The course of the contest was of an approximate length of 250 miles, and White did this with a total useful load of 1,160 lb., at an average speed of 97.21 miles an hour, and with a fuel consumption of 23 3/4 gal. The second winner carried 1,640 lb., at an average speed of 97.21 miles an hour, with a fuel consumption of 36 gal. The points were calculated on the basis of the ratio of fuel consumption to load and speed, and on account of alleged miscalculations in this connection, the donor of the trophy has taken out an injunction to prevent the Aero Club of Omaha from paying the official winner the \$3,000 cash prize which



Larsen Trophy for Airplane Efficiency. Won by Earle F. White, at the International Aero Congress, at Omaha

goes with the trophy. The Larsen efficiency trophy, with an over-all height of 4 ft. 6 in., is a product of the sculptor's art, strikingly symbolical of what it rewards. Standing on a diminutive globe, made of silver, are two figures, also of silver, one representing a mechanic and the other an army airman. They are holding above their heads a small airplane, made of gold. A propeller mounted at an equatorial axis of the globe symbolizes the ability of air craft to move the earth.

NEW ORGANIC-CHEMICAL ASSOCIATION

With the designation "Synthetic Organic Chemical Manufacturers' Association of the United States," a new society has been organized to represent the several closely related lines of manufacture included in this branch of chemical industry. The association is subdivided into four sections: dyestuffs, pharmaceuticals, intermediates, and fine organic chemicals. The main purpose of the association is to promote the manufacture in the United States of all kinds of organic chemicals, and to cooperate with the government in its effort to develop a complete organic-chemical industry. The association will take such collective action as will best aid the establishment of the organic-chemical independence of the United States.

OUTERS'-RECREATION OFFERS PRIZES FOR TRUE STORIES OR FICTION

For outdoor true stories, or fiction, on the subjects of hunting, fishing, camping, including auto camping, \$3,000 in cash prizes is offered by Outers'-Recreation, as follows: First, \$1,000; second, \$500; third, \$400; fourth, \$300; fifth, \$250; sixth, \$200; seventh, \$150, and eighth, \$100. Manuscripts must be typewritten, double-spaced, on one side of the sheet only. The title of the story must appear at the head of each sheet, but the author's name must not appear on the manuscript. On a separate sheet, attached to the manuscript, must appear: the title of the story; name and address of the author, and number of words in the story. Manuscripts must be mailed flat between sheets of cardboard. If return of manuscripts is desired, postage for the purpose must be inclosed. The story must not be less than 4,000 words nor more than 6,000. No manuscript will be entered which is postmarked later than March 1. No more than one prize will be awarded any author. Address: Contest Editor, Outers'-Recreation, 9 S. Clinton St., Chicago, Ill.

SCENARIO-STORY CONTEST FOR SCHOOLS OFFERED BY THE CHICAGO DAILY NEWS

A second scenario-story contest, similar to the first, announced in our November, 1921, issue, but open to school pupils only, is offered by the Chicago Daily News. The contest is open to all grammar-school pupils of the sixth, seventh, and eighth grades, and to all high-school students in Cook County, and the counties that lie wholly or partly within 100 miles of the city of Chicago. In each case the prizes will be as follows: First, \$500; second, \$250; third, \$100, with

additional prizes for the best scenario story in each grammar school in Chicago of over 250 pupils, one of \$15 for the whole school, and one of \$5 for each of the sixth, seventh, and eighth grades. There will be similar additional prizes for each high school in Chicago of more than 250 pupils, the \$5 prizes being for each of the first, second, third, and fourth-year grades. In each grammar or high school outside of Chicago, there will be awarded 25 prizes of \$15 each. Any scenario story submitted must be accompanied by a scenario-story certificate clipped from the Daily News, which must be signed by the teacher or principal of the school in which the student is regularly enrolled. The stories are not to exceed 2,000 words. All stories must be legibly written, or typewritten, on one side of the paper only. The contest closes for all schools on February 3, at midnight.

AN INTERCOLLEGIATE EDITORIAL CONTEST IN INTEREST OF CULTURAL EDUCATION

In order to stimulate the interest in liberal arts of every male undergraduate in every college and university of both the United States and Canada, and also in order to refute the claim, sometimes advanced, that the four-year cultural course is time misspent, Pi Delta Epsilon, Honorary Collegiate Journalism Fraternity, has announced that for its 1921-22 intercollegiate editorial contest the subject will be "The Practical Value of a Cultural Education." President Harding, a member of Pi Delta Epsilon, former editor and present owner of the Star, of Marion, Ohio, will represent the fraternity in the presentation of awards. Three prominent metropolitan-newspaper editors will act as final judges. A local contest will be conducted at each college and university, and the first prize winner in this

Nov. 28, 1921

contest will receive the "Certificate of Merit" of the fraternity, and will be eligible to submit his editorial in the national contest. Three prize winners in the national contest will be awarded the Pi Delta Epsilon gold, silver, and bronze medals. The contest is now open, and will close February 15, at midnight. Editorials submitted must not exceed 500 words, written in regular manuscript form, with an assumed name on the upper left corner of each sheet, and also on an accompanying envelope, in which should be sealed a paper bearing contestant's name, age, home city, class, and local address and telephone number. This is to be submitted to the local committee, who will forward it to the fraternity's contest committee, in care of P. C. Park, 6415 Greenwood Ave., Chicago, Ill.

REDMEN GAVE MASSASOIT MEMORIAL TO PLYMOUTH, MASSACHUSETTS

A statue of Massasoit, Wampanag Indian chief, was presented last Labor Day to Plymouth, Mass., by the National Order of Redmen. Popular Mechanics, in describing this incident in the December magazine, page 840, mistakenly credited the presentation to the Society of Mayflower Descendants, having been misinformed by a contributor who had proved reliable theretofore. Minnie E. Burke, librarian, and a native of Plymouth, calls our attention to the mistake and gives us a very interesting account of the unveiling. "The memorial," she states, "was paid for by contributions from Redmen all over the United States. It was unveiled on Labor Day by an Indian woman, the last lineal descendant of the great chief. The Redmen held their national convention in Plymouth on that day, and she unveiled the statue at their invitation. The statue is a memorial to Massasoit himself, in recognition of his kindness to the Pilgrims, and not a commemoration of the first settlement."

CIVIC INTERESTS PROMOTED BY NOVEL KIND OF CONTEST

With the object of promoting good municipal management, an original form of prize contest was instituted, last year, by a luncheon club of New Orleans, La. At the weekly gatherings, members were invited to submit suggestions in writing of work to be done in 1923 by the Association of Commerce. Prizes were awarded for the best suggestions. This provided the board of directors with much valuable material, when they met at the end of the year to arrange the 1923 program of the organization.

In answering prize offers please mention Popular Mechanics Magazine

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

BY C. A. BRIGGS

TIDES RESPONSIBLE FOR PRESENT LIFE FORMS

The insignificant portion of the earth represented by the narrow strip along the ocean shore which is covered and uncovered by the tides, appears to have had a profound influence on the development of life on the earth, according to the studies of a zoologist. He states that if life did not originate there, it at least in its earlier youth served an apprenticeship in the tides; and in its present form it is continuing to show the effects of its early environment.

A curious influence of habit was noted in this connection in the case of a small flat worm which lives in large numbers on sandy beaches in some parts of the world. These small animals come to the surface when the tide goes out, and burrow down in the sand when the water rises and reaches them. When they are removed from the beach to the laboratory and placed in test tubes containing sand, it is found that they move up and down at regular intervals of time, just as though the tide were present. Perhaps in their wormish way they think they cause the tides.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

American Forestry Association
1214-16th St
Washington
7907

AS SEMICENTENNIAL OF FIRST ARBOR DAY MAKE 1922 BANNER TREE-PLANTING YEAR

To celebrate the semicentennial of the first arbor day in the United States, held in Nebraska in 1872, the American Forestry Association calls upon women's clubs, civic organizations, and schools to make plans now for the spring tree planting this year. Its object is to make 1922 the banner year in tree planting.

CONTESTS PREVIOUSLY ANNOUNCED

Essays on Economics: Prizes, \$1,000 and \$500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize \$10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Research Thesis by a Woman: Prize \$1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lilian Welsh, Goucher College, Baltimore, Md.

Model in Clay by Students of Chicago Art Institute: Prizes, \$1,000, \$100, and \$50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

Cash Prizes for Needlework: Prizes, \$200, and others varying from \$100 to \$1; announced January issue, 1922; closes, Jan. 31; address, Star Needlework Journal, 260 West Broadway, New York City.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France.

Best Slogan Describing Razor: Prize \$300; announced January issue, 1922; closes June 30; address, Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

Essays on George Washington: Prizes, \$2,500, and others from \$500 to \$25; announced, January issue, 1922; closes Feb. 22; address "Essays," Chicago Tribune, 7 S. Dearborn St., Chicago, Ill.

The small suspension bridge described on page 389 of the October Popular Mechanics Magazine is located at New Carlisle, Ohio, instead of Winchester, Ky. It is an attractive feature of Silver Lake Park, owned by H. S. Credlebaugh.

7826

BY C. A. BRIGGS

QUARTZ CRYSTALS FURNISH STANDARD FOR HIGH TEMPERATURES

It has recently been discovered that quartz crystals can be used to establish very accurately a standard high temperature for use in calibrating pyrometers, the instruments used for measuring high furnace temperatures, and the like. When a crystal of this material is heated to 573.3° C., or 1,063.1° F., a sharply defined critical point is reached at which there is a rearrangement of the molecules, and heat is absorbed, causing a kink to occur in the rate at which the temperature of the quartz rises, as shown by a thermocouple making contact with it. Specimens of quartz from all parts of the world have been examined, and this critical temperature has been found to be very nearly the same in all of them, the differences being less than .5° C. The variation given by any one piece of quartz on repeated trials gives results within the same limit.

This property of quartz crystals just discovered has an interest and value which extend far beyond the laboratory and into the practical field.

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A scene on Broadway, New York, in 1890, showing the density of overhead wires



The same scene after the overhead wires were replaced by underground cables

Improvements

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Two-score years ago the telephone could hardly carry the human voice across a city. Now it carries it distinctly across this great continent. The once familiar network of overhead wires in large cities has been replaced by systems of underground cables, each cable containing thousands of slender, sensitive wires.

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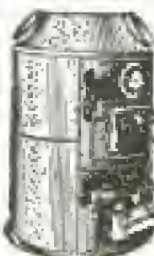
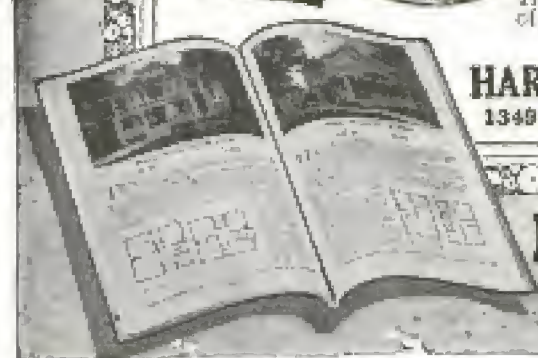
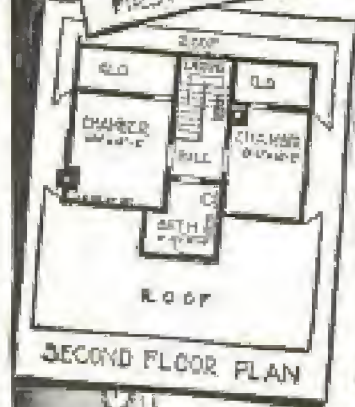
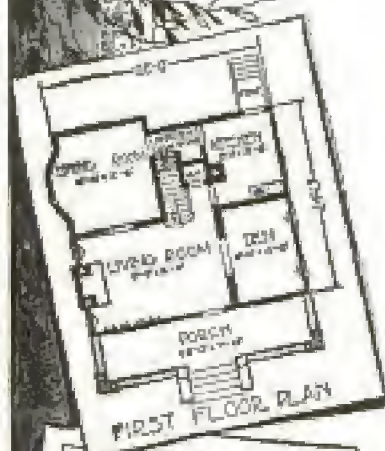
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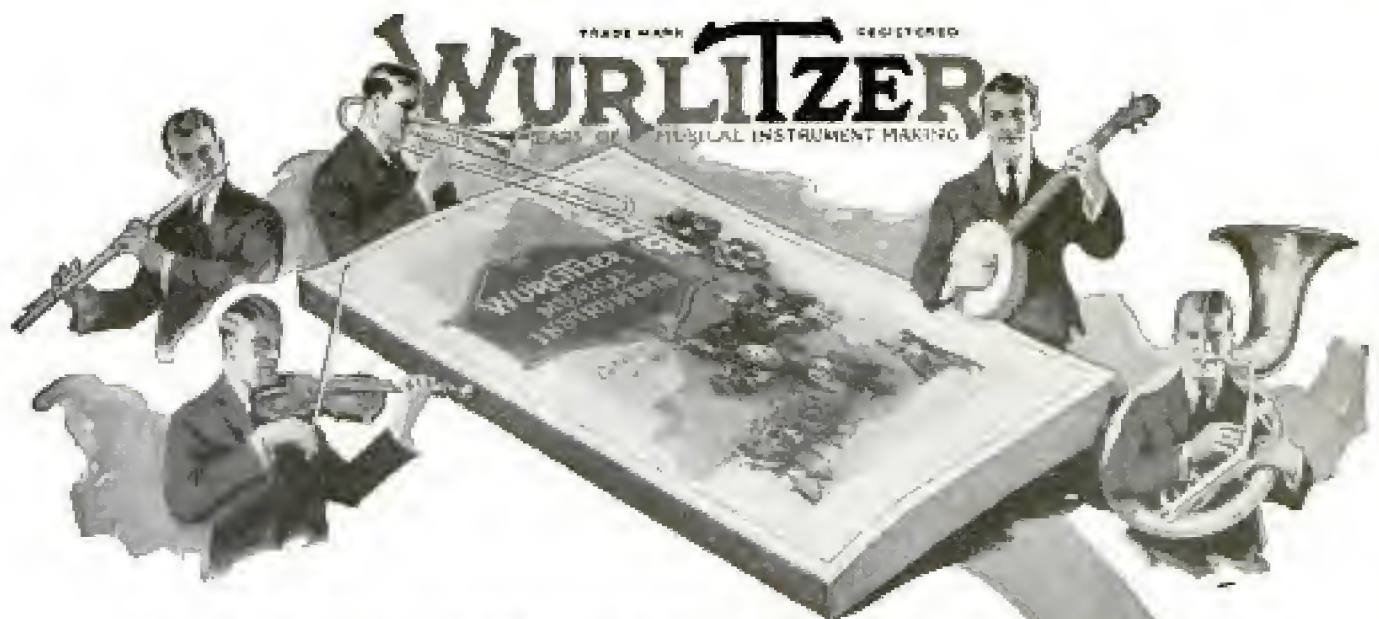
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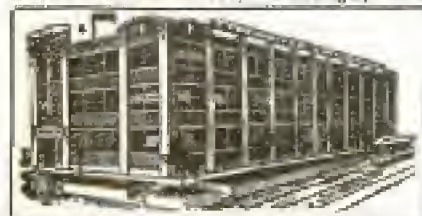
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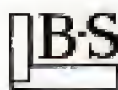
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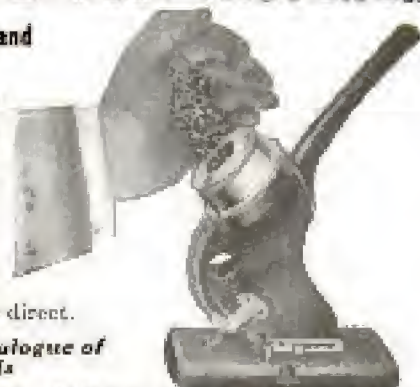
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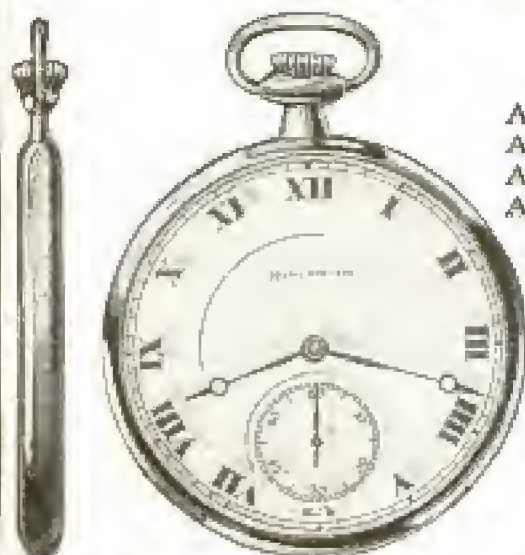
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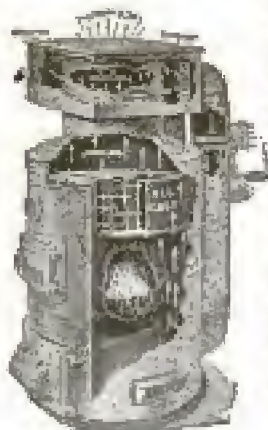
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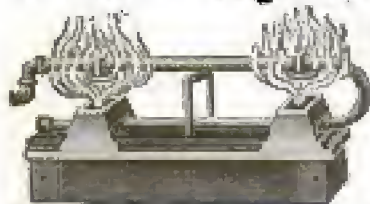
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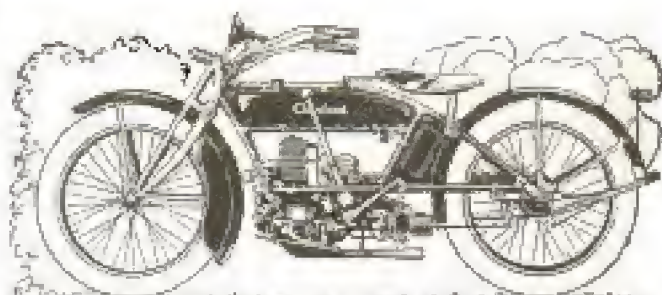
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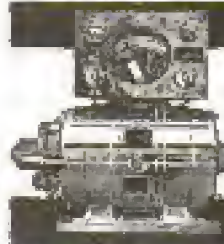
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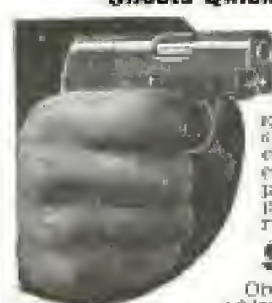
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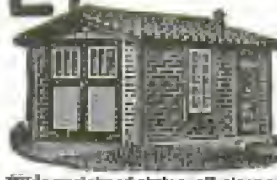
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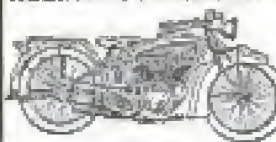
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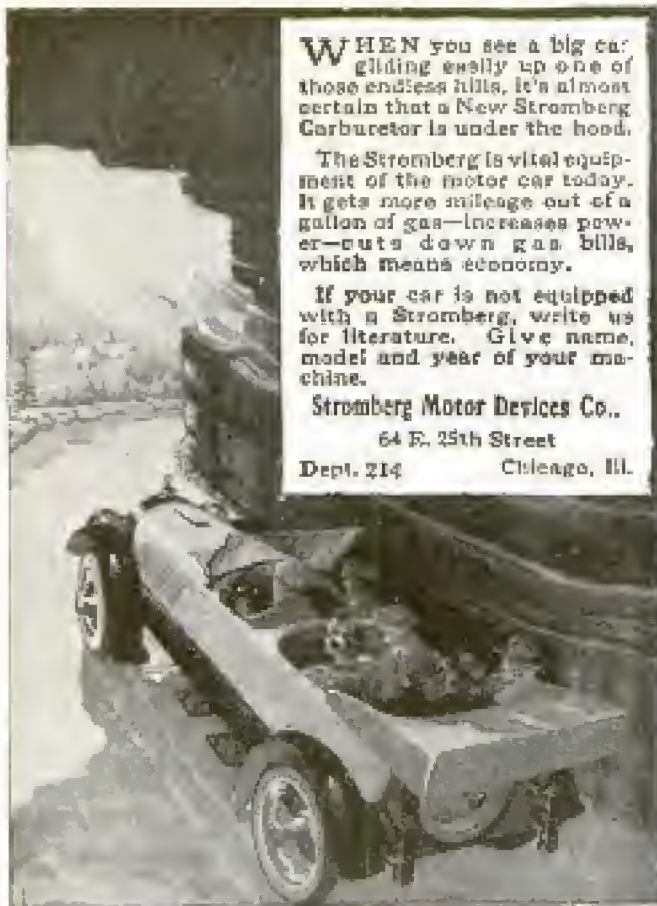
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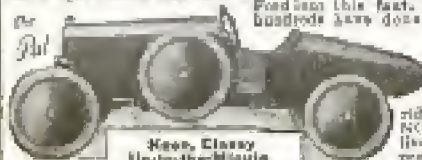
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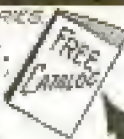
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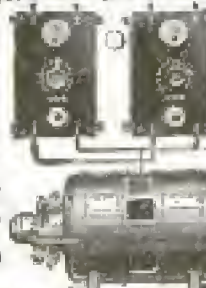
With winter here and batteries needing special care, HB battery charging can pay you \$150 to \$250 extra profit every month. Someone gets the business of charging those batteries—why not you? Start now—get a sturdy, dependable HB Charger with ample capacity to handle this profitable business.

THIS HB BATTERY CHARGER recharges 1 to 10 6-volt batteries or equivalent at once. Uses 2 or 3 phase city current (110-220-240) and best. Current costs 4¢ to 10¢ each—never more than 75¢ to \$1.00. Quick, clean, profitable results easily made.

Small Payment Pays This Money-Maker in Your Garage or Shop. Balance on easy monthly terms. Atlantic Shoney Bank Guarantee. Write TODAY for information. Ask about HB as a replacement, motor grinders, oil heating stoves, etc.

HOBART BROTHERS COMPANY
Box M-2
Troy, Ohio

Successful Manufacturers since 1890



—OLD KENTUCKY— HOME-SPUN TOBACCO

Direct From Our Farms to You

The Cream of the sweet crops Kentucky's beautiful soil can produce—ripe, rich leaves—smooth and mellow—with that rare old-fashioned flavor and fragrance that only the proper "aging" can produce. We bank on it you have never tasted a finer flavored, more satisfying tobacco in all your life.



Ripe, Rich, Old-Fashion Leaf

Our Famous Old Kentucky Home-spun is no more like manufactured tobacco than day is like night—guaranteed free from chemicals and all color adulterations. These careful inspections, decide the grade of leaves and determine the leaf. Green and mellowed by Kentucky's finest soil, cut at the center line, carefully selected, aged, mellowed, cured and "seasoned" by the same method our grandfathers used in preparing leaves for their own use—every trace of harshness leaves it—nothing to "bite" your tongue or parch your mouth—nothing to blow your taste. Mellow as the moonlight—fragrant as the rose. Take old time from the cellar for rich fragrance permeates the air. Thousands of tobacco lovers the world over agree by the honorable smoking and chewing qualities.

"For sixteen years I have used almost every brand on the market but yours is the best I ever tasted."—W. F. Davis, Jr., Marks, Penn.

Tobacco satisfaction is every way. I now realize how foolish I have been—paying exorbitant prices of the middleman instead of buying direct from the growers' association. W. F. Davis, Jr., Marks, Penn.

"Buy men, your tobacco is the best I have had since 1880 when Abraham Lincoln and I smoked together in the Bushy Branch. Tell all the old smokers about it."—John F. Davis, Marks, Penn.

REDUCE YOUR TOBACCO BILL 75%
We are growers of tobacco and will save you 75% on our own product—our cooperative marketing plan eliminates all middleman's profits. You deal direct with the growers' association thereby saving 75% or more. No fancy packages, no decorations—just Quality and lots of it.

MONEY SAVING PRICES
5 lbs. \$2.98—10 lbs. \$5.85

(We Pay All Shipping Charges)

5 pounds will make 65 lbs. of smoking or 15 cigars or 150 cigarettes. With each order we send complete illustrated instructions showing how to make guaranteed smoking, old-fashion chewing and smoking. Leaf, pipe, cigar, etc.

WE PAY ALL SHIPPING CHARGES

Send No Money

Pay only when tobacco arrives. Try it for ten days—if it fails to please you—well it doesn't suit your taste—if for any reason you are dissatisfied, send it back and your money will be returned promptly without question or question. You risk nothing. Send and read the coupon today and enjoy the tobacco that is your life.



Use the Coupon

TOBACCO GROWERS ASSOCIATION OF KY. MARKS, PENN.

TOBACCO GROWERS ASS'N OF KENTUCKY, Warehouse \$24, Mayfield, Kentucky

Send me 5 pounds of Old Kentucky Home-spun Tobacco by parcel post prepaid. I will pay the price of 5 pounds, no return. If not satisfied after a 10-DAY TRIAL, I will return the tobacco and you will refund my \$2.98.

Name: _____

Address: _____

Enter below pounds each grade wanted:

SMOKING: —mild —medium —strong

CHEWING: —mild —medium —strong

Please Mention Popular Mechanics

You Can Save \$50.00

By Recovering Your Old Auto Top Frame Yourself

We make these recovers to fit all makes and models of cars. Any person that can drive a car can put it on. We furnish instructions. Roof and quarters sewed together with rear curtain, fasteners, welts and tacks. All complete. Give us the name, year and model number of your car, and we will send you our catalog with samples and quote you exact price.

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\$5.40 and up
Parcels
Post Paid

Auto Owners WANTED!



To introduce the best automobile tires in the world. Made under our new and exclusive Internal Hydraulic Expansion Process that eliminates Blow-Out—Stone-Bruise—Rim-Cut and enables us to sell our tires under a

10,000 MILE GUARANTEE

We want an agent in every community to use and introduce these wonderful tires at our astonishingly

low prices to all motor car owners.

Write for booklet fully describing this new process and explaining our amazing introductory offer to owner agents.

Hydro-United Tire Co.

Dept. 100 Chicago, San Francisco, Pottstown, Pa.

AUTO DRIVERS



Can make big money in spare time or devote entire time to introducing and taking orders for our

IMPROVED CORD TIRES

Highest quality. Sensational prices. Big profits. Permanent business.

Write today for catalog and agent's special offer.

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Dept. 104 CHICAGO

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This tiny little car driven by gasoline motor, can be built by any boy. New plans, bigger, better than ever, now ready. Send \$2.50 for building plans and price list of parts when you want to build this lad's car.

SYMPER MFG. CO.
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MAKE BIG PROFITS CHARGING BATTERIES \$20*Brings You an HB*Charger

Balance on long easy terms, more than paid for by your big monthly profits. No expense for bulbs, burn-outs or expensive renewals. Sizes for 6, 12, 18 or 24 batteries. Write us for recommendations on how to make your biggest profits. HB users clear \$100 to \$200 monthly—you can, too! Write today.

Hobart Brothers Company
Box M 222 Troy, Ohio



SHOMONT WHITE COLLIES

Thoroughbreds—the Aces of All Dog-doms. The most beautiful dogs in the world. Intelligent, fearless, faithful. They guard your home, watch your herds, play with your children. A dog guaranteed right. Write for circulars. **SHOMONT KENNELS** BOX 101 MONTICELLO, IOWA

An Easy Way to Make Money

Don't be content to plod along on a small salary. Be independent. Go in the tire repairing business and make \$60 or more a week. One man made \$45 the first day he received his outfit. Others are making \$25 a day and hundreds of wide-awake men are making \$200 to \$500 a month.

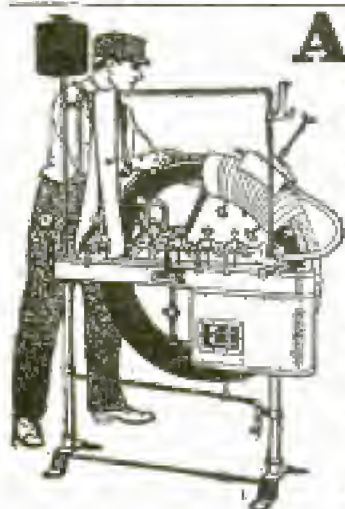
No experience needed. We teach you how. Very little capital required. But slight risk, as every car owner in your town is a possible customer. Jobs are plentiful because tires blow out and puncture every day. Business is good the year round.

SHALER Tire Repair Outfit, \$75

Will do as much and as perfect work as the big \$250 to \$500 vulcanizing outfits. A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has Automatic Heat Control. It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

WRITE FOR FREE BOOK "HOW TO OPEN A TIRE REPAIR SHOP" and complete Catalog, which gives full information. **WRITE QUICK BEFORE SOME MUSTLER GETS AHEAD OF YOU.**

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NOW ONLY \$295
PRICES SMASHED

Was \$625.00 Direct from Factory

1922 Model H. U. 1250 Watt

Lalley Light and Power Plant

Electricity for Farms and Rural Places

World's greatest lighting plant value. My famous model H.U. 1250 watt capacity Lalley Plant sold until recently for \$625. You can get it, if you act promptly, for only \$295, complete with battery, direct from factory to you. Anyone can install it. Adequate capacity for your future needs. Proved by 12 years' service. Guaranteed. Approved by National Fire Underwriters—30 days' trial—terms. Don't confuse this big 1250 watt capacity Lalley with smaller plants. Don't miss this opportunity.

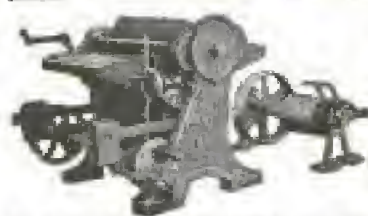
FREE! Write today for free literature and information. ACT NOW—as I may have to increase this price almost any day.

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 Lalley Light Corp.
 Dept. 73
 Detroit, Mich.
Save \$330



Electric light and power for Farms, Country Homes, Summer and Winter Cottages, Lumber Camps, Yachts, Motor Boats, Charging Batteries, etc.

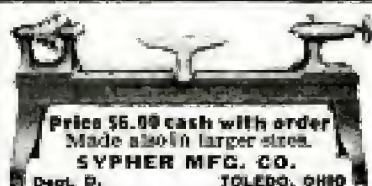
WAS \$625.00 NOW \$295.00



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Swing 4 in., 11 in. between centers, 17 in. total length. Shipping weight 13 lbs. Bed of lathe is machined. Workmanship first-class. Equipped with wood turning chuck. Can be fitted with 3 in. face plate and drill chuck as special equipment. Order one today.



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NEW MOTORS

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 STANDARD MANUFACTURERS
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ALL PHASES AND FREQUENCIES IN STOCK AT ALL TIMES

Largest exclusive Mail Order Small Motor dealers in the world.

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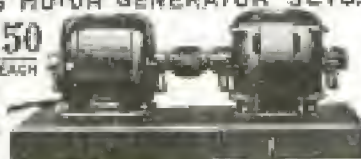
WIRELESS, TELEPHONE GENERATORS

500 VOLT - 100 WATT - 3400 R. P. M.

FOR MOUNTING MOTOR GENERATOR SETS.

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*"Just like
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 face with
 a towel"*



Perfectly
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 FOR \$1.00 with six
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 steel. Packed in black
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 cents. IN CANADA
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This 1/4 hp A.C. Motor \$13⁵⁰

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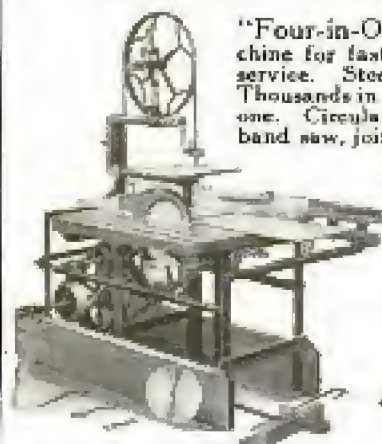
Send cash with order or we will ship by express C. O. D. if you prefer.

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Put this PARKS in your workshop!



"Four-in-One"—a husky machine for fast, clean work and long service. Steel frame construction. Thousands in use. Four machines in one. Circular rip and cross-cut saw, band saw, jointer, and borer. Guaranteed 10 years, 10 days' free trial.

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List price \$165 and up according to size. When ready to buy send for Lathe Catalog and prices.

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The original Spring Chuck Bench Lathe. Six sizes, with attachments for Turning, Screw Cutting, Milling, Drilling, Grinding, etc. The best for laboratory, experimental and manufacturing purposes. Prices, No. 4, with Milling Attachment, like cut, \$365.00. Plain Lathe \$155.00. Catalog free. **STARK TOOL CO., Waltham, Mass.**
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See One To-day



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10 in 1—

Adjustable Pencil, pen, paper knife, ink eraser, pencil sharpener, nail file and cleaner, mechanic's marking point, fine compass with screw attachment, foot rule.

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REDUCED PRICES

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	Standard Change Gear	Quick Change Gear		Standard Change Gear	Quick Change Gear
9"x3' Lathe	\$176.00	\$216.00	16"x8' Lathe	\$452.00	\$512.00
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ESTABLISHED 1906

SOUTH BEND LATHE WORKS,
625 E. Madison St. **SOUTH BEND, IND.**

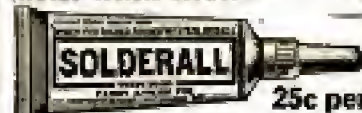
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A Paste That Turns Into Metal When Heated

Our New Improved Torch

\$1.50

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A match will do it, but best results can be obtained by using our new improved torch. Requires no acid or soldering iron. Joins or repairs wires, metal or metalware. Sold by Hardware and Electrical Stores, or sent by us postpaid.



COMBINATION SET \$1.75
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Dealers Send for Quantity Prices
Beware of Imitations with Similar Names

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Always Ready
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Strong brass-tempered
material. Any length, 2
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Dealers and agents: Request attractive proposition.

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ARKOGRAP

Protect your tools from theft. Write any name, engrave any design on metal with electricity as easily as writing on paper with pen or pencil. Complete outfit \$1.50, prepaid anywhere. Interest-free installment order free. Write today. Agents Wanted. Arkograp Pen Company 695 Capital Ave. Portland, Oregon

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"The Saws Most Carpenters Use"

HENRY DISSTON & SONS, INC.

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We are now able to supply these wonderful instruments for terrestrial and astronomical observations. Cut shows new type 3" portable terrestrial. Light weight—compact—easily carried anywhere—highest quality throughout. Circular and prices on request.

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Makers of the famous "Yerkes" and "Lick" Telescopes
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"Red Devil" Pliers made in 100 styles—one for every need. Known and used the world over. Style 1024—6½ inch, from dealers or from us, \$1.25.

Do that difficult drilling job right and in less time with a

Red Devil

Reg. U. S. Pat. Off.

Chain Drill

JUST the tool for that difficult drilling job! It makes it easy for you to drill engine cylinders, angle irons, pipes, pipe flanges, tanks, boilers, wagon tires, etc.

The "Red Devil" Automatic Chain Drill drills with less work on your part

than driving an auger bit through wood. No adjustments necessary—saves drills—saves time—no pressure required—the automatic feed does it all.

The "Red Devil" Chain Drill is portable. Weighs only 2¼ lbs. You take the tool to the work, instead of the work to the shop.

Uses ordinary twist drills, either round or square shank, from 2 to ½".

At all reliable dealers everywhere or from us \$4.80. Mention style 2018.

Write for mechanic's tool booklet

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Manufacturers of "Red Devil" Tools

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"Red Devil" Glass Cutters—the glaziers' stand-ard tools of the world. "It's all in the wheel." Made in 40 styles. No. 024 shown here, \$0.50.



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"The Biggest Little Lathe Built"

A real engine lathe—small, sturdy, compact, low-cost—guaranteed to do all small work with 1/1000 of inch accuracy. Built with the same care and precision that made **MONARCH ENGINE LATHES** the world's standard of quality and efficiency.

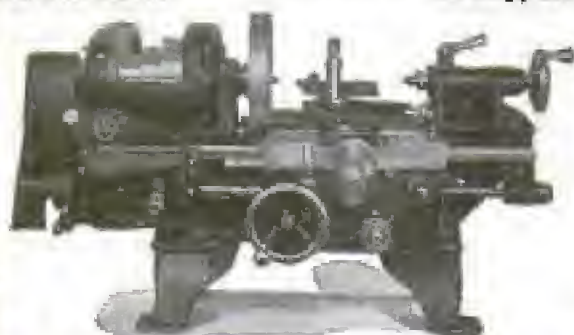
THE MONARCH JUNIOR is ideal for beginners. Occupies small space in your own home or shop. Easy and economical to operate. Simple and trouble-proof, automatic safety features. Fully equipped.

The Greatest Achievement in Lathe Building History

Monarch Junior 9 in. \$225 With Bench Engine Lathe

Full particulars and a Monarch Junior Catalog will be sent you on request.

THE MONARCH MACHINE TOOL CO.
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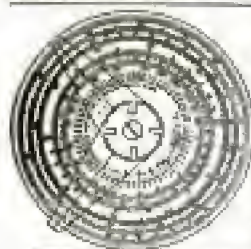


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Tools In Handle



A complete repair shop in itself. Sew anything heavy or light, leather, shoes, harness, buggy tops, covers, belts, etc. \$1.00 Postpaid.
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The Midget "FIVE-IN-ONE" Slide Rule is a combination Mannheim, Log-Log, Add and Subtracted, Polyphase and Binary Slide Rule. It will instantly add, subtract, multiply and divide any combination involving whole numbers, fractions, decimals and mixed numbers. Gives every possible root and power of every quantity. The graduations are printed on metal, coated with white enamel and are grass and water-proof. While it is the most versatile calculator ever invented, its operation is simple and easily understood. Distributor 4 inches. Price with 16-page Instruction Book, \$1.50. Enclosed carrying case \$2.00 extra. Cash in free. Your money back if you are not satisfied.
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Save Money On Your Tools!

Save your tools—prevent damage—discourage "borrowing"—have your tools in order and increase your efficiency.

A style, size and price to suit your trade and purse. Catalog free.

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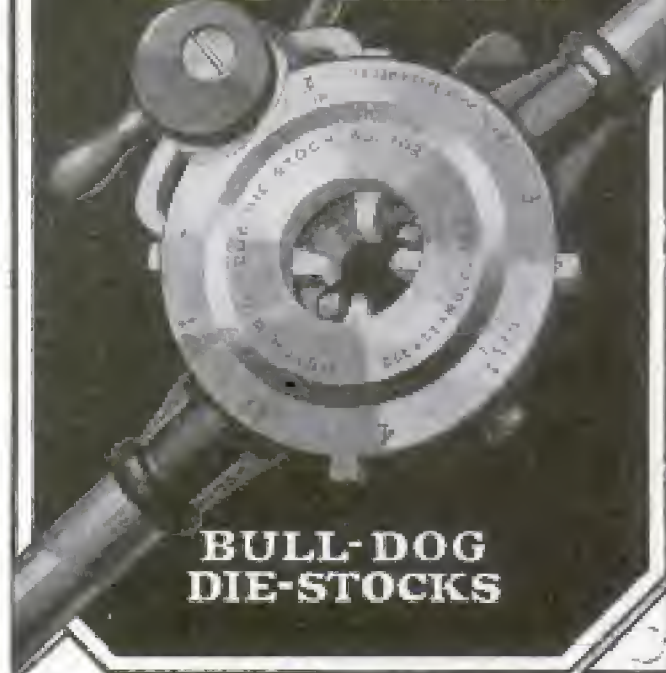


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Send for illustrated folder describing the tools with the 5 Big Features—Oster Bull-Dog Die-Stocks.

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No. 2010
Special price \$2.98

The Greatest Discovery the World Has Ever Known. Paid to advertise these famous 100 diamonds, we will send you one of these 14K gold rings, postage paid. When it arrives pay nothing \$2.98 O.A.D. always to your door, etc. Only 10,000 rings given away. Money refunded if you can take from a postage diamond. Send size of finger.

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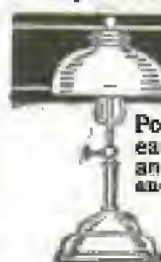
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The WONDERFUL ERICKSON PATENT LEG

Will not chafe, overheat, nor draw end of stump.



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Positively the cheapest and strongest light on earth. Used in every country on the globe. Makes and burns its own gas. Casts no shadows. Clean and odorless. Absolutely safe. Over 200 patents, 100 to 2000 Candle Power. Fully Guaranteed. Write for catalog. **AGENTS WANTED EVERYWHERE**
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BALE 'EM UP with Bernard's! Pliers with the open throat that will swallow a wire a mile long. A vise-like grip and a sure, clean cut. Many styles and sizes at hardware dealers.

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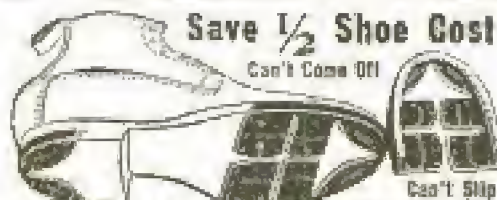


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Coats, Suits, Mitts, Chokers, etc., made from your own or lamb's fur. Enormous savings. Write for FREE CATALOG today. Tell everything.
ARTHUR FELDER FUR CO.
Dept. PM, 25 N. Dearborn St., Chicago, Ill.



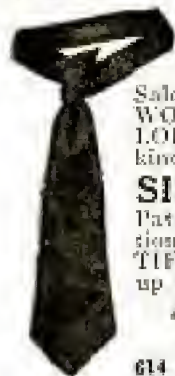
FLEXIBLE STEEL SOLE AND HEEL PLATES

Make sole and heel out-last uppers. Bend to fit shoe. Non-skid; corrugations prevent slipping. Freight 2 oz. Tacks with plates; put on yourself; money back if not satisfied.

By mail postpaid. Set (sole and heel plate) Men, Women or Boys' size. **50c**

Agents, dealers, cobblers wanted.
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No More Shapeless Twisted Neckwear



Salesmen wanted everywhere. MEN AND WOMEN take orders for high grade TAILORED neckwear, cheaper than ordinary kind. Lasts and looks five times better.

SIX MONTHS' GUARANTEE

Patented. Not sold in stores. No competition. No delivering. No collecting. BEAUTIFUL SILK SAMPLES. Customers hunt you up to place their orders.

ASK FOR EVERY DAY MONEY PLAN

BETTER-MADE CRAVAT CO.

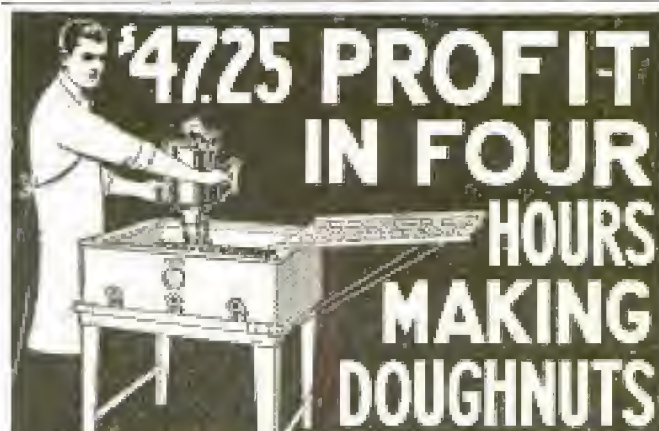
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Boston Garters never grow tired of their job—holding socks in place. They stay "Peppy" no matter how much leg work a chap has to do.

GEORGE FROST CO., BOSTON, Makers of Velvet Grip Hose Supporters for All the Family



Take in \$25 to \$100 a day with this Machine.

Doughnut Making business has wonderful possibilities. Doughnuts have taken country by storm. Enormous demand must be supplied. \$25 to \$100 a day earned with this Automatic Doughnut Machine. Capacity 800 doz. a day. Doughnuts sell fast at 40c to 50c a doz., netting over 100% profit. No experience needed. Plant ready prepared—add water—put dough in hopper—turn crank—out drop sweet, savory, golden doughnuts.

Money-Making Possibilities are Unlimited Put this Automatic Doughnut Machine in display window and attract crowds; earning color when appetite you take in money fast. J. F. Dougherty, Pa., says: "Made \$47.25 profit four hours after set up machine." Others report earnings equal or better. Big money wholesaling in hotels, stores, restaurants, etc.

Be First Man in Your Town To Start This Big Paying Business. Get in on the ground floor—act quickly before others start. These machines pay big anywhere—no towns too small. Get full details of this new, profitable business—it costs nothing to see. Visitable, big and small coupon today.

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BUTLER MFG. CO.

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Send details of Automatic Doughnut Machine and business.

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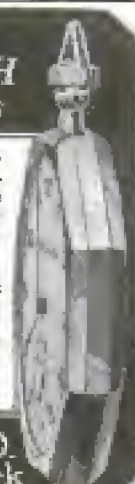
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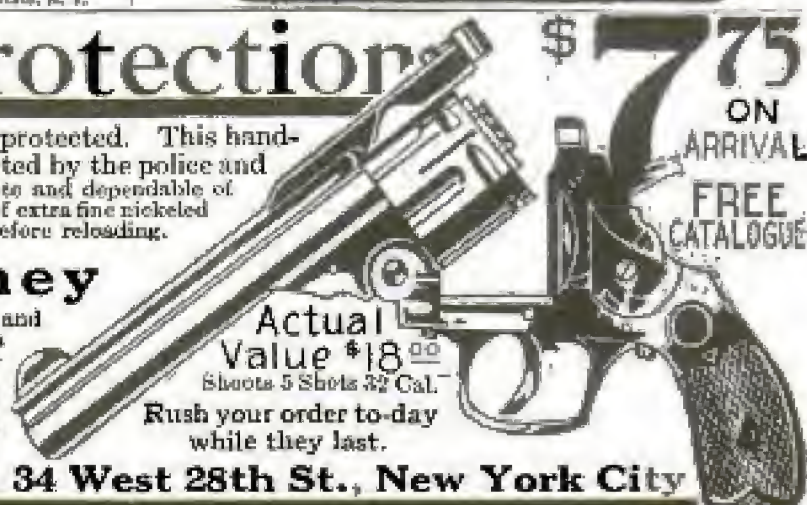
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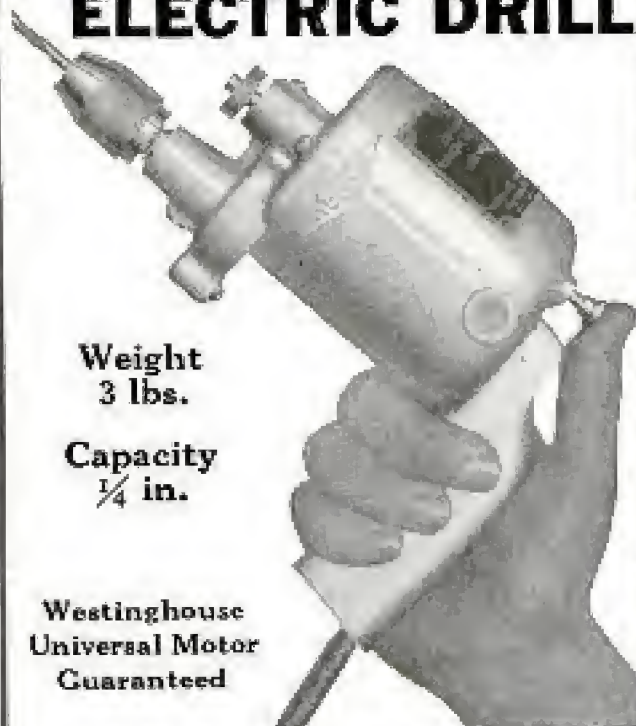


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Another request from a large corporation, dated June 27, 1921, follows: "Should you have clients whose inventions are worthy of commercial manufacture and exploitation, we shall be glad to consider the financing of such projects, if they are interesting. In that event, we indicate also that we are identified with two large machinery manufacturing plants located, respectively, in Bridgeport, Ct., and Providence, R. I. These plants, besides having their own foundries, are thoroughly equipped to manufacture anything from a small lathe to a complete automobile. Whether your clients have mechanical inventions or otherwise, we shall be pleased to hear of any proposition requiring financing."

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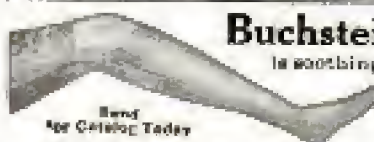
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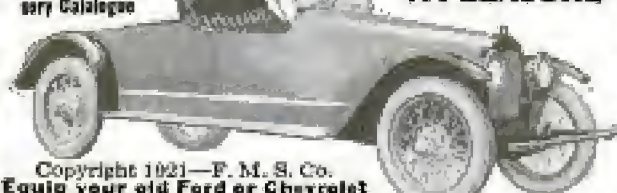
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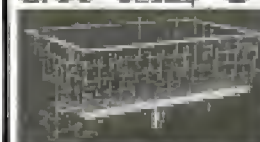
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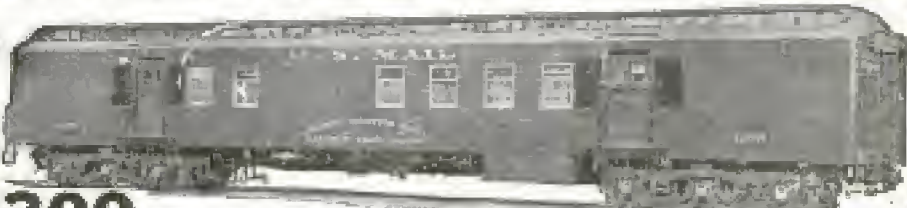
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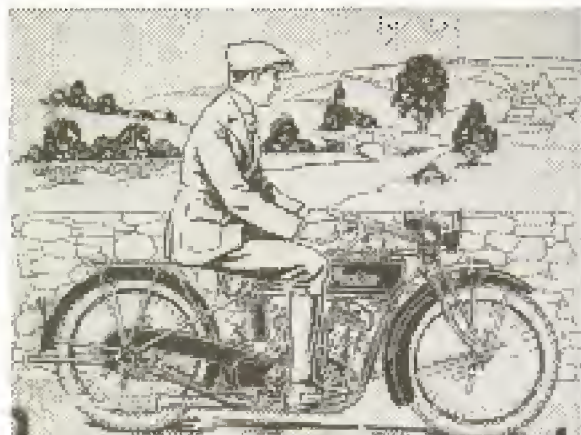
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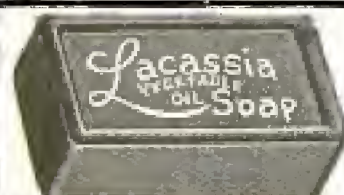
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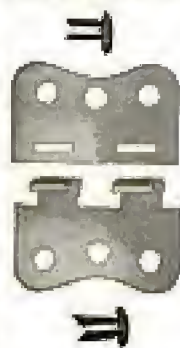
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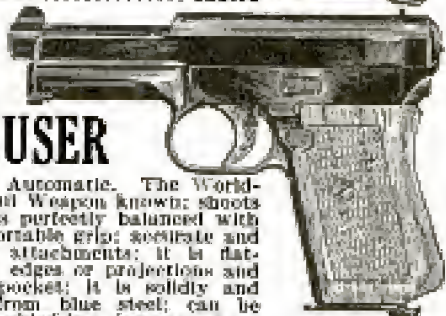


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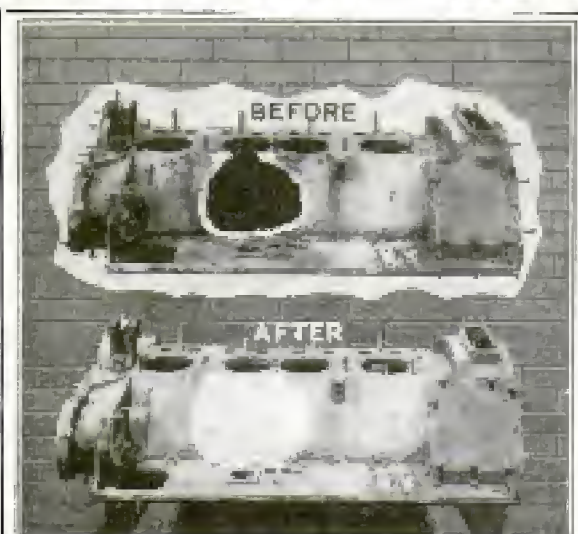
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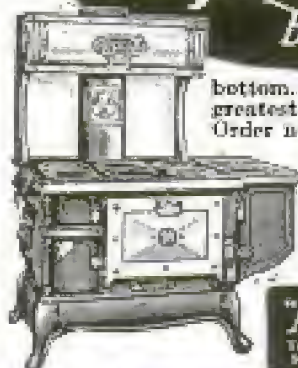
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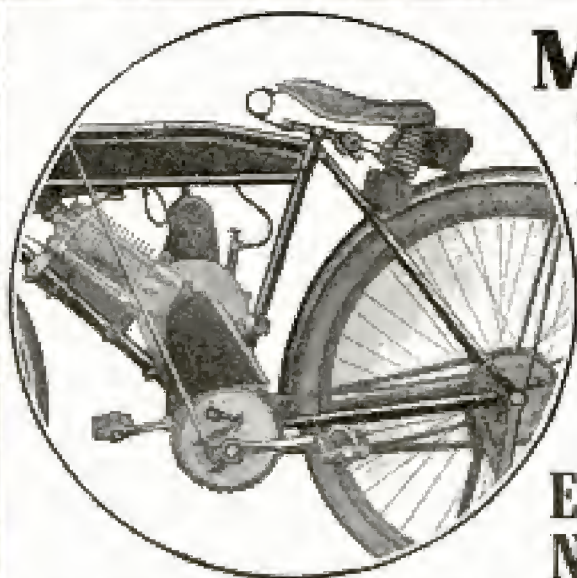

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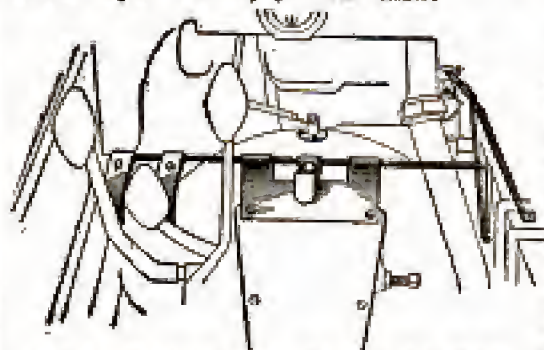
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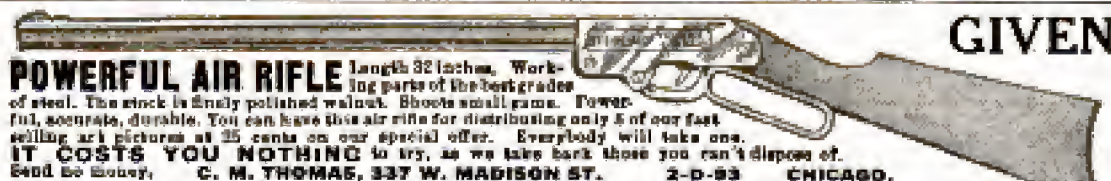
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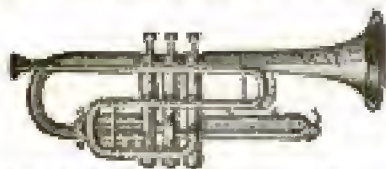
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BUESCHER

True-Tone Band Instruments

TIRE AGENTS WANTED \$4000 A YEAR

I'll Show You How to Make More Money Taking Orders For Mellinger Tires

I want exclusive Agents, all or part time, to handle Mellinger Extra Ply and Cord Tires under the **MELLINGER PLAN**. No experience necessary. My Plan literally guarantees your success without risk or investment. Thousands of car owners say Mellinger Tires are the best and most serviceable made.

Guarantee Bond Up to 10,000 Miles

behind my Extra Ply and Cord Tires. Everywhere Mellinger Tires are making big money for agents and giving Auto Owners **BETTER TIRES FOR LESS MONEY**. My new low prices amaze everyone.



I Guarantee Your Profits

So confident am I that you can earn big money under the **MELLINGER PLAN**, that I literally guarantee your profits. The **MELLINGER PLAN** offers you a permanent business. No matter what you are doing—what you are making—let me put this remarkable plan in your hands. I don't ask you to carry a big stock—to risk **ONE CENT** of an investment. Sample Sections Furnished. My **BIG FREE BOOK** tells you all about it—about tires—their construction—how sold—explains manufacturers', jobbers', retailers' prices—tells you **WHAT REAL WHOLESALE PRICES ARE**. A post card brings you this remarkable book by return mail.

Prove It for Yourself

Don't buy anyone's tires until you see these amazing values—see these tires on your own car. **THINK OF IT**. Oversee Cord Tires for less than Fairbanks used to cost. Read amazing reports of my agents' successes under the **MELLINGER PLAN**. Read what Car Owners say about these Super-quality Tires. Read how you can get a brand new set of Mellinger Tires for a little of your time and good will. I'll take all the risk to have you try Mellinger Tires on your car. Tires shipped prepaid on approval.

My Amazing Offer

I say this is the big thing for you—your opportunity for a big future—wealth—independence—big business with hosts of friends and customers. I appoint only one exclusive agent in each locality. Let me explain the **MELLINGER PLAN**—let me show you. Tweedle, of Maine sells \$1438 in few short weeks. A. M. Arlian of Montreal, Porto Rico sold \$4024 in seven months. Kelihley of Idaho, says: "I have sold \$900 worth of tires since I took the agency and all have given good satisfaction." These are ordinary results—you can do it—you can make \$4000 a year—you can make more. **BETTER TIRES FOR LESS MONEY** are business getters. **DON'T SEND A CENT**—fill in the coupon this minute before you turn another page—tear it off—mail it now—My Big Free Book will be in your hands in a few days.

MELLINGER TIRE & RUBBER COMPANY
1069 Oak St. Kansas City, Mo.

Mr. B. L. Mellinger, Pres.,
Mellinger Tire & Rubber Co.,
1069 Oak St., Kansas City, Mo.

Without obligation, send me details of the Mellinger Plan, Free Book and Wholesale Prices and how, without investing any money, I can become your authorized agent.

Name

Address



MAKE MORE MONEY

TORIT ACETYLENE TORCH No. 13

For welding, heating, melting, tempering, auto radiator repairing, and for all kinds of small jobs requiring a hot living torch.

An improved method—saves time and affords greater convenience over old methods of using gasolene, kerosene or charcoal.

For stoves, electricians, dentists, jewelers and every kind of repair shop.

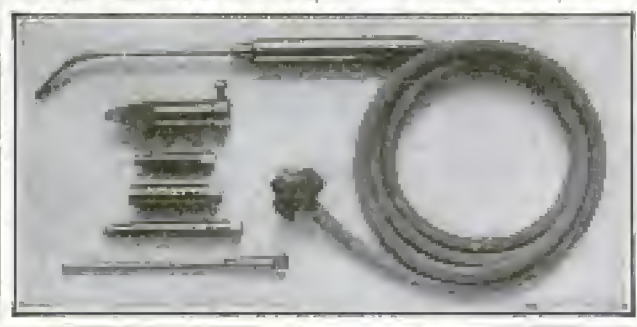
USES ACETYLENE GAS ONLY

A splendid use for discarded auto tanks, and a profitable investment.

Torch with 4 tips for different kinds of work, welding, cutting, etc., and tubing and connections for auto radiator tank.

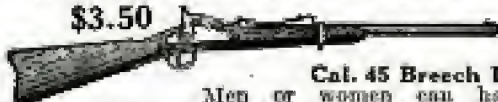
ST. PAUL WELDING & MFG. CO., 137 W. 2d St., ST. PAUL, MINN.

750



SPRINGFIELD CARBINE

\$3.50



Cal. 45 Breech Loading

Men or women can handle it with perfect safety. This style and calibre used by the Army for over 30 years and is simple in construction. Used and in first class condition. Inside barrel like new. Length over all, 41 inches. Weight 7 lbs. Can be loaded and fired 10 times a minute. **\$3.50.**

Then for \$3 more you may have a smooth bore barrel to shoot shot, for small game, snipe sparrows, kill a chicken and what not. This is a wonderful combination. The smooth barrel can be interchanged by anyone in 5 minutes. Millions of Bird or Ball shot cartridges, 3 cents each.

W. STOKES KIRK, Dept. P. M.
1627 N. 10th St., Philadelphia, Pa.



ClearTone
FOR

PIMPLES

Your skin can be quickly cleared of Pimples, Blackheads, Acne Eruptions on the face or body, Enlarged Pores, Oily or Shiny Skin. **\$1,000.00 Gold**

Cash says I can clear your skin of the above blemishes. **WRITE TODAY** for my **FREE** Booklet—"A Clear-Tone Skin"—telling how I cured myself after being afflicted for fifteen years.

E.S. GIVENS, 129 Chemical Bldg., Kansas City, Mo.

Make

A

New

Farm

in

Ten

Days

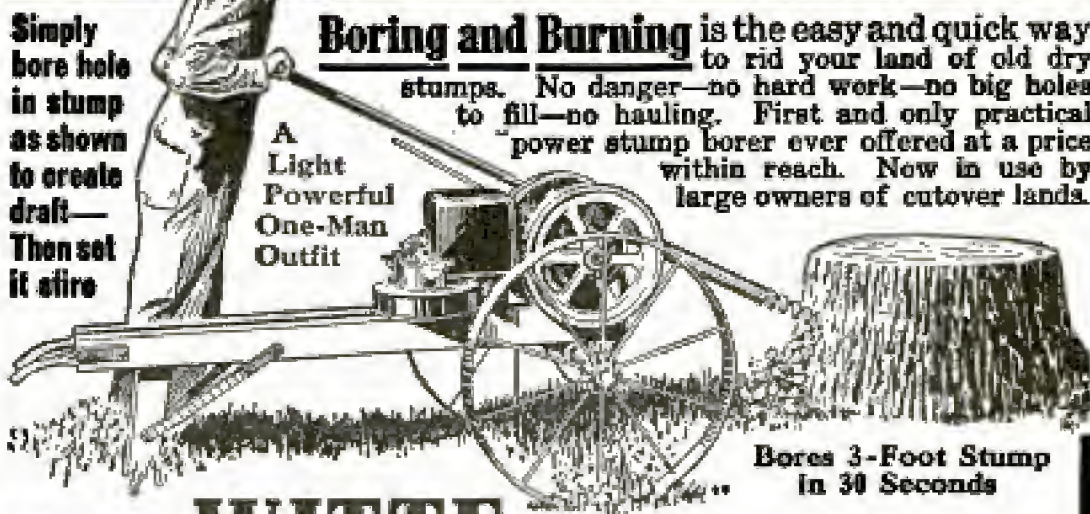
**Save \$25 to \$75
An Acre
Clearing
Land**

**BORE
and BURN
YOUR STUMPS**

Simply
bore hole
in stump
as shown
to create
draft—
Then set
it afire

A
Light
Powerful
One-Man
Outfit

Boring and Burning is the easy and quick way to rid your land of old dry stumps. No danger—no hard work—no big holes to fill—no hauling. First and only practical power stump borer ever offered at a price within reach. Now in use by large owners of cutover lands.



Bores 3-Foot Stump
in 30 Seconds

The WITTE Stump Borer

**Earn \$10 to \$15
a Day**

BIG CHANCE for men who are first in their locality to get busy boring and burning stumps for others.

TELL US

How many acres of stumps you have and we will send you some interesting information how to get rid of them quick.

Converts your valuable stump land into a big, productive farm. Lightest, most powerful and easiest to handle. Bores a 2 inch hole through the average stump in less than a minute. Lever Control. Start or stop auger without stopping engine. Specially built engine develops over 8 H.P. Use either kerosene or gasoline. BOSCH Magneto built in. Engine simple and easy to operate. Outfit complete as shown.

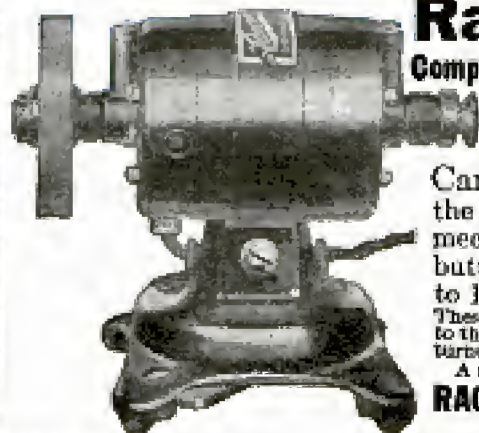
Costs Less Than 5 Cents a Stump

Counting 40 stumps to acre, you can cover 2 or 3 acres a day—bore a hole through every stump. Start your fires with blow torch and auger shavings. Thousands of acres of valuable cut-over lands throughout the U. S. are waiting for the practical use of this wonderful outfit in either burning or blowing. Order now while we can make prompt shipment. Directions for operating the WITTE Stump Borer, and best method of burning stumps with each machine.

Use Engine For Other Work Special clutch pulley enables you to use engine for all classes of belt work. Every outfit sold on LIFE-TIME GUARANTEE same as all WITTE Engines. Cash or Easy Terms. Write for complete description.

WITTE ENGINE WORKS,

1174 Oakland Avenue, KANSAS CITY, MO.
1174 Empire Building, PITTSBURGH, PA.



Race Electric Grinder \$16⁵⁰
Complete With 3" Emery Wheel, Grooved Pulley and Electric Cord

F. O. R.
CHICAGO

For sharpening tools, polishing or grinding, the Race Motor Grinder will prove a great convenience in the Carpenter Shop, Machine Shop, Garage, at Home, or on the Farm; it is a practical machine that will prove its value to every mechanic. It is portable, plugs into any electric light socket, push button start and stop, operates on either A. C. or D. C. current of 110 to 130 volts, or 25 to 60 cycles. Weighs only 7 lbs.

These small Grinders are dependable in every respect and satisfactory service is guaranteed to the extent that if you are not entirely pleased after ten days' use, the Grinder may be returned to us and your money will be cheerfully refunded.

A neat adjustable tool rest can be supplied for \$1.50 extra if desired.

RACINE UNIVERSAL MOTOR CO., 4642 Ravenswood Ave., Chicago, Ill.
ATTRACTIVE DEALER PROPOSITION

2-Year Guaranteed Batteries at Lowest Prices



HIGHEST standard battery made by one of the oldest standard battery companies in America now comes direct from the maker to you without a single profit in between.

Most remarkable battery opportunity ever offered to car owners.

Two year written guarantee. Highest bank references. Prices in many

batteries bought through dealers and much lower than ordinary mail order batteries jobbed through mail order houses.

Sample Prices

Ford, Studebaker, Chevrolet, Dort... \$14.95
 Buick, Overland, Essex, Reo... \$17.70
 Hudson, Nash, Maxwell, Dodge... \$21.95

Prices like these, as you must know, are lower by far than any other battery prices ever made. And the reason is, there is not a single extra profit—not even a jobber's profit—in between.

Send no money—order direct from these prices, being sure to state name, model and year of car, and battery will be sent immediately by express C. O. D. Order to-day. Remember, highest standard batteries by one of the oldest standard battery companies in America at lowest prices ever offered.

Defiance Battery Company

Direct Sales Department 11
 725 Hearst Building, Chicago, Ill.

Finest Instruments Are Easiest to Play



You cannot learn to play correctly on a cheap, imperfect instrument and expect to achieve success in music. The best teachers will always recommend the finest instruments for their pupils.

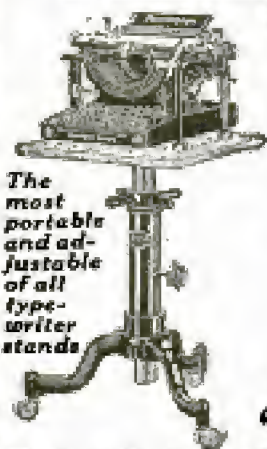
King Instruments Now Easy to Own

A quarter century ago the first King Brass Instrument was made to the specifications of a famous artist, and for years thereafter Kings were made and sold only for cash to great musicians. But now, our new easy payment plan makes it possible for anybody to own a King. You can now buy direct from the factory, save middleman's profit, and get a brand new, acoustically perfect, laboratory-tested King Instrument. And, with every new King goes our famous free factory-service and guarantee.

Big Stock of Used Instruments
 Thousands of musicians have turned in good instruments as part payment on new and better Kings. These used instruments we sell for cash at very low prices. They are refinished and look like new. Send for our latest complete catalog and list of these bargains before they are gone. Ask for details of easy payment plan on new instruments.

KING

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 5237 Superior Avenue,
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The most portable and adjustable of all type-writer stands

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ONLY \$100 DOWN

Brings You The World Popular "SATELLITE" TYPEWRITER STAND

That's all—just a single dollar bill and we will send you the famous portable and adjustable, indestructible "Satellite" Typewriter Stand—brand new—1923 Model—direct from the factory. **You need not send a penny now.** Simply send us your name and address for full details of our amazing Free Trial Easy Payment Offer.

10 DAYS' FREE TRIAL

Positively we will ship you the Satellite Typewriter Stand on 10 Days' Free Trial in your own home or office. Convince yourself of its serviceable features, its durability and its appearance. See how much better and faster work you can do when the keyboard is adjusted to the exact height you want. This is the same stand used by Morgan & Co., Standard Oil, Larkin & Co., Fruehauf, Hamilton, Hamilton Typewriter, Dayton Laboratories and thousands of others.

EASY PAYMENTS

If you decide to keep it after 10 days' free trial all you have to do is pay the balance in small monthly installments. If for any reason you do not want it, ship it back to us and we will refund your dollar and all shipping charges.

Remember our supply of stands for this offer is limited.

Send today, without delay, for full free particulars of this great offer.

Adjustable Table Company
 Dept. 2212 GRAND RAPIDS, MICH.

AGENTS \$1.75

YOU CAN Sell This For



and Give **FREE** These Shears



MY! HOW THEY SELL!

ONLY 20 Boxes A Day Means \$18.00 Daily Profit

You get the interest with the free Shears. Walter Harris sold 800 boxes in 5 weeks. Profit over \$100.00 a week. A total retail value of \$4.80. A real bargain at \$1.75. The array of fine toilet goods (that always appeals to lady's heart) will dazzle her eye, and when at the end of your talk you state the low price of \$1.75 for these 11 articles, with the shears FREE, the money is yours, even if she has to borrow, or beg it.

ACT NOW! Sells like hot cakes year 'round. A baby could sell Lucky 11. Don't delay a minute. Save time. Send \$1.75 for complete outfit including display case. At least write for circulars explaining our unique plans, including 30 other packages. **ACT NOW.**
 E. M. DAVIS CO., Dept. 2352 CHICAGO, ILL.

Make \$200. to \$1000. Profit Monthly

With Balba Perfume Sales Machines

There were \$760,000,000.00 worth of perfumes and toilet preparations sold in one year in the U. S. Approximately one-third of this, or \$250,000,000.00 was spent for perfume. Humanity has always wanted to radiate fragrance and today the demand for perfume is greater than ever. Men, women and children love to use it. They spend a dime for it, when they can't spend more. Dimes fairly flow into the Balba Sales Machines. The average machine will make about 80% profit per month on the first investment and repeat the earnings monthly. Just think what this means—one machine containing 100 bottles in an average location will empty every 30 days and the profit is \$4.00. That means only 3 1-3 people use the machine daily. Assuming a man owns 100 machines, he will average \$400 profit a month. It's the greatest opportunity ever offered to people with a little money. It is a clean, legitimate, safe, permanent, big profit business. It earns day and night. Can easily be handled in spare time. You own machine and business. Machines Fully Guaranteed.

Balba Bouquet Perfume

Exquisite in Fragrance and Quality

Balba is a lasting perfume of rare and wonderful quality—it radiates a fragrance of elegance and refinement about the wearer. Where Balba machines are in use, hundreds are regular customers and buy from 5 to 12 bottles at one time, because of the convenience in size—they are easily carried in vanity case, hand-bag, coat or vest pocket.

25c to 35c Value—Price 10c a Bottle

Balba is a high, quality, exquisite perfume. We manufacture it in large quantities and sell it only through Balba Sales Machines in plain, inexpensive bottles, thus reducing the cost and leaving out all middle men's profits for we sell direct.

Sold Only Through Balba Sales Machines

Balba Sales Machines are always ready to wait on customers—never high-priced nor wasteful—have no overhead expense—are attractively nickel-plated—give out a fragrance that attracts the customer—practically theft-proof—easy to fill—simple to operate—nothing to break or get out of order—weather proof, can be placed out of doors in any climate—occupy small space on wall or counter—get and hold customers because it's the lowest priced way to sell perfume and give the highest quality and largest quantity.

We Want Balba Sales Machines in Every City, Town and Recreation Resort

We have thoroughly proven that Balba Bouquet Perfume is a good seller—it repeats—it makes new users. Balba machines in good locations show an increasing business, which proves we have hit the safe, sane, logical way to sell quality perfume. Think of this small investment as compared with the 5c and 10c stores and yet they make millions yearly. We are now going to offer a tested, proven, big profit, permanent business to a live person, (man or woman) in each territory. We do not sell territory rights—we sell an allotment of Balba machines in proportion to population, large cities may be subdivided, and then give the purchaser exclusive rights to sell Balba perfume in that territory. There is no other perfume sold like this, and as quickly as we get general sales distribution, we are going to advertise Balba nationally.

FREE Newspaper Advertising in Your Territory

When our representatives have bought and placed a full allotment of Balba Sales Machines we will then run advertising in his local newspaper, giving the locations of all the Balba Sales Machines. This makes every one start buying Balba, and the Balba quality makes them buy again. We tell you how to place machines and handle them. In a short time, when we have general distribution of Balba, we will advertise in the National weeklies and Women's magazines and make Balba popular every place.

Guaranteed 100% Earnings or Money Refunded

We guarantee that Balba Sales Machines will earn at least 100% on their original investment the first year, provided the machines are all placed in use and kept filled, or we will refund the original price of the machines and perfume then on hand and take them back.

Write NOW for complete information, literature and sample of Balba. Territory given to first to qualify. A telegram holds territory until you get our proposition. Act quickly if you want choice locations. Remember Profits are made in Dimes.

References: Northern National Bank, Toledo, Ohio, or R. C. Dun & Co.

THE BALBA CORPORATION of AMERICA

Dept. 42

1306-1308 Jackson St.

Toledo, Ohio, U. S. A.



WHERE BALBA MACHINES CAN BE PLACED

Theaters	Moving Picture Houses	Waiting Rooms
Pool Halls	Billiard Parlors	Drug Stores
Depots	Apartment Houses	Cigar Stands
Clubs	Public Buildings	Hotel Rooms
Restaurants	Hotel Lobbies	Hotel Lobbies
Cafeterias	Ticket Offices	Travel Bureaus
Restrooms	Street Car Shelters	Lodge Rooms
Trains	Ice Cream Parlors	Fruit Stands
Parks	Office Building Lobbies	Candy Shops
Bath Rooms	Passenger Buses	Lunch Counters
Factories	Recreation Buildings	Shoeing Mills
Rest Rooms	Interurban Cars	Hotel Cars
Boats	Shoe Shine Parlors	Barber Shops

Send 10c Coin or Stamps

With name and address for full size bottle of Balba Bouquet Perfume. This offer is open to any one.



ART-GEM

The Stone
that defies
Diamond
Experts—

We want you to be the sole judge of the Blue-White-Perfect Art-Gem, the most wonderful scientific Diamond known. We say it is Blue-White, Perfect-Cut, and full of fiery sparkle, radiance and brilliancy; that it has diamond hardness and acid resisting qualities and only an Expert can distinguish it from a Genuine Diamond. You too will say the same or we don't want you to keep it.

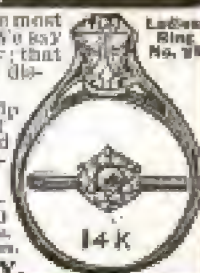
SEND NO MONEY Just rush your name, address, style and finger size (a slip of paper just long enough to meet over the second joint of your finger will do) for your Art-Gem. It weighs one and one-quarter Carat and is mounted in 14K (Guaranteed U. S. Assay) Solid Yellow or Green Gold for gentlemen and 14K Solid Yellow, Green or White Gold for ladies.

Wear It 15 Days FREE. Give it every test used to determine genuine diamonds—then if it proves to your complete satisfaction, pay \$3.00 monthly for three months. Unconditional return to us and get your money back with a question on return, by return mail, immediately. You can feel risk, thereby demand \$1.50 with the postman when your ring comes.

ART GEM COMPANY

Dept. 77

138 5th Ave., New York, N. Y.



BINOCULARS

SPECIAL VALUE in high grade, genuine, imported FRENCH PRISM Condé Binoculars. Give remarkably clear and brilliant image. Come in an elegant, plush lined, genuine calf skin carrying case with straps.

\$45.80

Including War Tax

8 POWER, 32 mm. 23 OZ.

BRAND NEW—not war stock! Sent C. O. D. express prepaid, subject to examination and 10 day approval. If not satisfactory we refund your money and pay return charges.

Order Now! Over 1000 pairs sold. Wonderful value. Order now or write for descriptive folder.

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A NEW WAY TO GET YOUR CLOTHES ABSOLUTELY FREE

and Make Big Money during your spare time—something different, better, bigger, more liberal than any offer ever made. Lower prices—better clothes—bigger cash profits—express or postage paid on everything.

DOUBLE PAY

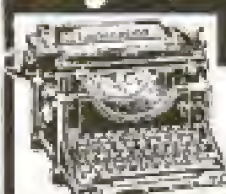
Free Clothes and Cash Profits Besides. You can easily earn \$30.00 cash, extra, every week during your spare time, taking orders for our made-to-measure clothes. We don't ask you to loan your cash profits for your own clothes. That's not our way of doing business. Ours is a new and better plan.

Witty-ale stylish, real cloth samples—FREE colored fashion plates, latest wholesale prices—everything **FREE.** Just drop us a line today and we will send complete outfit **FREE.**

SPENCER MEAD CO., Dept. E-148, Chicago



Try This Typewriter 5 Days FREE



\$4.00 and You Keep it

The balance in easy monthly payments. Save fully \$25 to \$50 on any standard make. Every rebuilt machine guaranteed in best perfect condition. Try 5 days at our expense. Write for special prices. A postcard will do. Send NOW.

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—tells all about raising chickens, care, feeding, etc. Quotes special low prices on eggs for hatching, poultry, baby chicks, incubators, brooders, and poultry supplies, fully illustrated, sent **FREE**

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The "MILLEN" Magneto Recharger for Ford cars, known as "MILLEN" is the magnetos call and has been known to last for years in less than 2,000 miles of use, improving mileage both in use. No storage but no trouble. It operates from any alternating current light socket. It also operates from Ford Lighting Plants, Direct Current Circuit, Storage Battery, and Dry Cells. No need to wear out. No upkeep cost. Works 12 hrs. Used and recommended by Authorized Ford Dealer. **ORDER ONE TODAY.** Save \$25.00 Cash plus. Agents, get your share right now. A 10-day trial, money-back if not satisfactory—proceeds you. Catalog **FREE.** Write today.

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Aladdin Homes

Save \$200 to \$800

Aladdin Homes will save a substantial amount for you through eliminating dealers' profits, saving over 18% waste in lumber and lowering labor costs in building. Aladdin Homes come to you direct, thereby reducing freight charges, and are cut to fit, saving waste of lumber and hundreds of hours of carpenter labor. Send stamps for the Aladdin catalog at once.

Bungalows, Dwellings, Summer Cottages

Aladdin prices include all the timbered frame work, millwork, the siding, outside finish, porch, shingles, windows, doors, interior woodwork, latb, glass, nails, hardware, lock sets, paint, stains and varnish. Send stamps today for catalog No. 1568.

THE ALADDIN CO.
BAY CITY, MICH.

Branches; Offices and Mills: Portland, Oregon; Wilmington, North Carolina; Hattiesburg, Miss.
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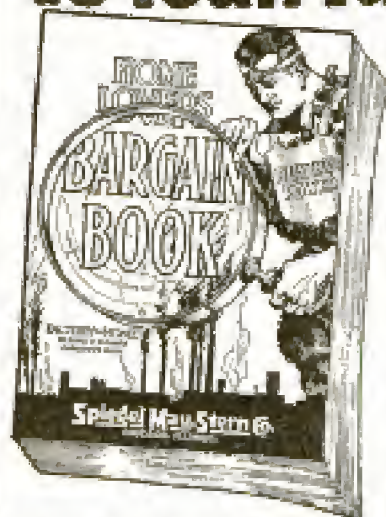
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Guarantee

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Now comes a concern big enough to loan *furniture* free while you leisurely decide on it



Our new Home Lovers' Bargain Book is absolutely Free to you. In it we show many thousands home needs all loaned free. Entirely as an extra advantage we bring the most agreeable longest credit—free to all. No matter how clearly and simply we state these facts—it's all so different, so entirely new—that some folks will go right on thinking it cannot be so. For fear the least shadow of a doubt can remain in anyone's mind we go way beyond mere promises. We guarantee every statement we make here. This free loan guarantee comes with our free book. It is legally binding.

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We realize that before you decide on any purchase, even though the article seems to be

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With our free book comes a credit certificate that opens your account in advance. This credit is offered freely to everybody. No matter where you live, what your position may be, or what your earnings are, it makes no difference.

There is never any annoyance; no bother before you order or afterwards. We have no collectors; we hate red tape. After all, our credit feature is simply an added added advantage. We loan things to everybody alike, whether they pay cash or use their credit.

That is what makes our plan so different. That is why our offer is so new. That is why credit here cannot ever mean extra costs, nor annoyances.

After you decide to keep an article, begin to pay little by little. If not satisfied we bear every expense—all freight and handling charges.

You see we have done away with all formality;

all old-fashioned rules and embarrassing practices. It's just a friendly arrangement. We never write to your neighbor or employers or try to pry into your affairs.

If you are the least likely to need the slightest thing for your home now or in the next six months or year, have our free Home Lovers' Bargain Book on hand for comparison purposes, if nothing else.

Just mail a post card.

Spiegel, May, Stern Co.

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**The Famous
YORK
Saxophone**

*The
Easiest
Instrument
to Play
Sent to You
ON
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TRIAL*



Yes, you can have the World famous York Saxophone shipped to you on 10 days' Free Trial. Play it at home for ten full days. Convince yourself of its superb quality and richness of tone. And then, if our instrument does not completely sell itself to you simply ship it back to us, and it won't cost you a penny.

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Fill out the Coupon now with your name and address and simply mention the instrument you are interested in and we will send illustrated literature and full details of our Trial Offer and Easy Payment Plan. This literature also tells you how to practice and how to learn to play. Send Coupon today.

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Grand Rapids, Mich.

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**J. W. YORK & SONS,
Dept. 2212, Grand Rapids, Mich.**

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Kindly mail, without cost to me, your beautifully illustrated literature and details of your Free Trial and Easy Payment Offer.

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INSTRUMENT.....

(Mention above the instrument most interested in)

1/6 H.P. Motor Less than cost to make \$10



F. O. B. Chicago

Here's the chance of your life to get a motor to run your washing machine, ironer, dish washer, compressor, bench lathe, blower, fan, drill press,

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Delivers full 1-6 H. P. with liberal overload capacity. Made for 110 volts, 60 cycle current. (Also for 25, 30, 40, 50 cycle at 220 volts, if desired, at \$1.00 extra.)

Motor strictly high grade. Backed by a substantial manufacturer. Cancellation of a big order reason for this opportunity. Our loss is your gain.

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Satisfaction Guaranteed or Money Back

New motor or free repairs if anything goes wrong within one year. Parts always obtainable. Net weight 20 pounds, shipping weight 26 pounds. Easy means of reversing direction of rotation. 10 ft. cord with 2-piece attachment plug, 65c. Pulleys, 1 1/2 inch or 2 inch, 50c. Order quick, don't lose out. Send cash or order C. O. D. by express.

REYNOLDS ELECTRIC CO.

2610 W. Congress

Chicago, Ill.

Own a Factory Like This~



YOU CAN! Make canvas gloves. Nation-wide demand, big market everywhere. Retail in dozen lots. Wholesale in thousand lots. Splendid profits. You can go into this wonderful business. Factory shown above grew in three years from two sewing machines. Same rapid development possible for you.

We Furnish Equipment Free

We start you in business. No experience needed. Very little capital required. We teach you how to make quality gloves—how to market them. We do all this for you—start you out right—with understanding that you buy materials from us so long as you cannot do better elsewhere.

Big Market in Your Locality

Many wear canvas gloves. Farmers, laborers, linemen, mill men, drivers, gardeners, and so on. Millions of pairs required annually to supply vast demand. You can undersell big manufacturers. Can operate on closer margin. Can build wonderful, paying business in just few months.

Write for Full Particulars

Don't pass this opportunity without investigation. We tell all about this business in interesting booklet. Costs nothing to learn about it. Your reply is ready in small minute we get your name and address. Send it tonight. Delay may be costly, as we are furnishing only a limited number of FREE equipment. Write NOW!

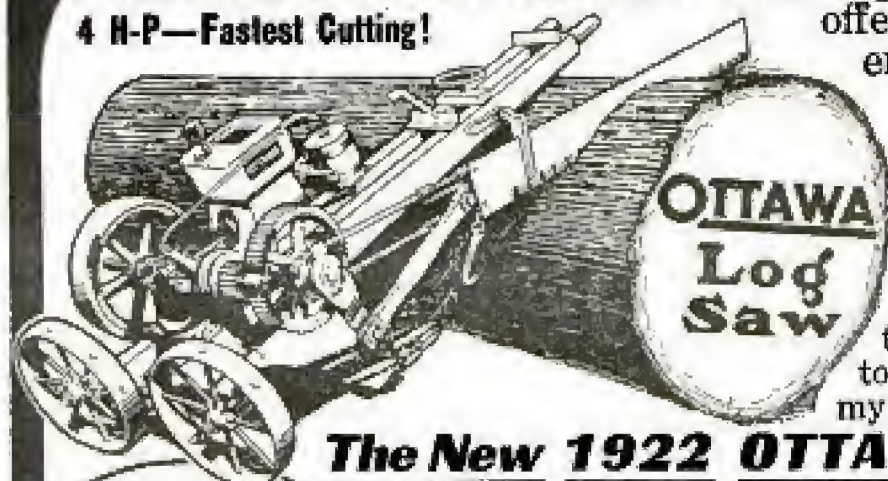
McCreary Mfg. Co., 301 Factories Bldg., Toledo, O.

Big Special Offer

on One-Man Log Saw

Every man with wood to cut will be interested in my latest offer on the world famous OTTAWA Log Saw. It's the greatest offer I have ever made! It enables any honest man to own this fastest cutting money-maker and work-saver. If you want a log saw now or in the future, NOW is the time to Act! Use the coupon below and send today. Let me tell you about my great money-saving offer.

4 H-P—Fastest Cutting!



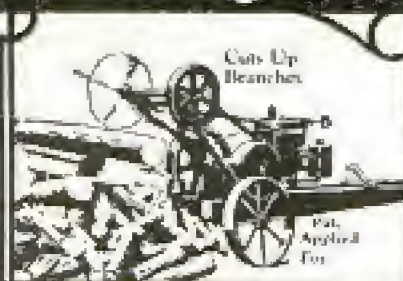
The New 1922 OTTAWA Cuts Faster!

Makes 350 cuts a minute—almost 6 a second! Saws right through the toughest log. And it cuts the human way—the easy, sure, safe way, because of the **POWER FORCE FEED**—an exclusive OTTAWA feature. It is the Standard Log Saw of the World! It does more work—quicker.

Magneto Equipped. No batteries. The New 1922 OTTAWA comes all ready for use. 4 H-P Motor. Nickel Chrome valves—just like high priced automobile motor. Has all power needed for sawing and belt work. Wide, hard bearings.

Prompt Delivery: To save you from 1/2 to 1/2 on freight and to get your OTTAWA to you more quickly, we have sent this new 1922 model to 9 conveniently located warehouses: Albany, Pittsburgh, Indianapolis, Atlanta, San Francisco, Dallas, Portland, Pueblo, St. Paul, Ottawa, Kansas. **Ottawa Ships 'em Quick.**

30 Days Trial; Cash or Easy Terms



Prices Way Down!

A real saving on this greatest of all Log-Saws if you act quick and take advantage of my Special Offer! Greatly reduced prices and the easiest kind of terms on this **Guaranteed** outfit. Get full particulars. See

Get This Book

Wood
Sawing
Encyclopedia
FREE

what you save. Don't wait; don't delay. Act NOW!

Get Free Book; Clip Coupon Now

Just write your name and address on the coupon opposite—or a post card, if you prefer. Then send it today! Get my New Book, beautifully illustrated in colors. Describes the new 1922 OTTAWA and tells how hundreds are making big money selling fire wood. Also get my Special Offer—it will surprise you! Send NOW.

H. C. OVERMAN, Gen. Mgr.

OTTAWA MFG. CO.

1748-Q Wood St.

OTTAWA, KAN.

H. C. Overman, Gen. Mgr.,
OTTAWA MFG. CO.,
1748-Q Wood St., Ottawa, Kansas

Send me your New Book and Special Money-Saving Offer on New 1922 Model OTTAWA Log Saw at once, without any obligation on my part.

NAME

ADDRESS



\$215⁰⁰ In One Day

New Invention Sweeping Country Like Wildfire!

NO wonder this amazing new invention is bringing fortunes to agents. All over the whole country this new device is doing away with old-fashioned methods of heating with coal stoves, ranges and furnaces. Already over \$1,000,000 worth have been sold. You can readily understand why this new invention—the Oliver Oil-Gas Burner—is sweeping over the country like wildfire. It does away with all the expense of coal—making every stove a modern oil-gas burner. Saves money, time and drudgery. Three times the heat of any other method. No wonder agents are riding in on the tide of big Oliver profits!

**AGENTS
Are Making Fortunes**

These men know the secret of big money. They know a good thing when they see it and they know that the time is ripe for this new Oliver improved Oil-Gas Burner. They know that this age of high-priced coal and wood makes it necessary for some substitute. They see ships and locomotives being run by oil and big buildings being heated by it. And they know that

an invention that makes use of this cheap fuel for every home—and yet does it so as to give more heat than coal or wood—is the thing they want to tie up to.

Big Profits Quickly Made

You too can use this secret of big money. You do not need to be a high-powered salesman. The Oliver's amazing features sell it for you. When people see it they know at once that it is the thing they want. You will realize that this is a proposition that will pay you as big money as it does others. We have a definite number of open territories which we are ready to dispose of to those who act quickly. Every territory allotted is filled with big-money opportunities. And this big money comes easily. Because not only does this invention practically sell itself on sight, but when you have sold **one** this one will sell several others as soon as your customer's friends and neighbors see it. And thru our special plan you get credit and commissions for every sale in your territory.

You can also make big money just by using your spare time. Note how Norton Brown made \$43 in one evening.

Coupon Brings Full Offer

If you want to make at least \$5,000 a year easily, until this coupon now for our offer. We are not making any extravagant claims about this. We do not have to. We believe that your common sense will indicate a good proposition to you when you know about it. We want to give you the facts. Won't you write us? And by doing so quickly you will be allotted an exclusive territory with private selling rights.

The coupon will bring you the facts and will save you writing a letter. But mail the coupon at once.

OLIVER OIL-GAS BURNER AND MACHINE CO.
2014-N Pine Street, St. Louis, Mo.

SAYS F. W. Bentley of Philadelphia

"Ya Gads—some fellow I made \$215 today!"

Buys Car with Profits

"Have earned enough in one month to buy me a new auto."
B. W. Knappen, Cal.

\$7 Profit per Hour

"I started out and made \$21.50 in about 3 hours. The Oliver does the work. It certainly is the real thing."
L. Becker, Ohio.

"Sells Like Beer in a Dry Town."

"Am sending today for 7 Oliver's. This is our day's orders (\$42 order). Selling like beer in a dry town."
W. H. Dyer, Mich.

Mr. T's 28th Order in Six Months

"Sold 30 Oliver's 30 No. 28; 4 No. 12 No. 21 No. 4." (Mr. T's profits on this order alone is \$110.)
G. T. Collins, Ont.

Russel Earned \$3300 in Five Months

"Have averaged \$600 profit a month for last six months."
A. M. Russell, Conn.

Carnegie— \$1000 a Month

"Am making \$1000 per month. I have made big money before but did not expect so much. Your burner is just the thing."
J. Carnegie, N. D.

Berger—

\$253.50 per Week

"Send following weekly orders: 10 No. 12; 8 No. 21; 4 No. 4."
H. Berger, Ont.

\$31.75 in Ten Minutes

"I took order for a neighbor, \$31.75 profit in ten minutes."
Mrs. N. H. Hartsburg, Miss.

\$43 in One Evening

"I made \$43 last night selling Oliver Burners."
N. H. Chiles, Wash.

It Sells Itself

Agents find it no work at all to sell this amazing invention—the Oliver new improved Oil-Gas Burner. They just show it—taking only one minute to connect it—then light it. And the sale is made! This new invention is its own salesman. It sells itself! The Oliver Oil-Gas Burner is the most timely thing that could be put out. It dispenses entirely with coal and wood when both are now high-priced. It burns the cheapest fuel—oil. It saves a woman work now in times when she is looking for just such things. Just as much or as little heat as wanted, off and on instantly by simply turning a valve.

The Secret of Big Money

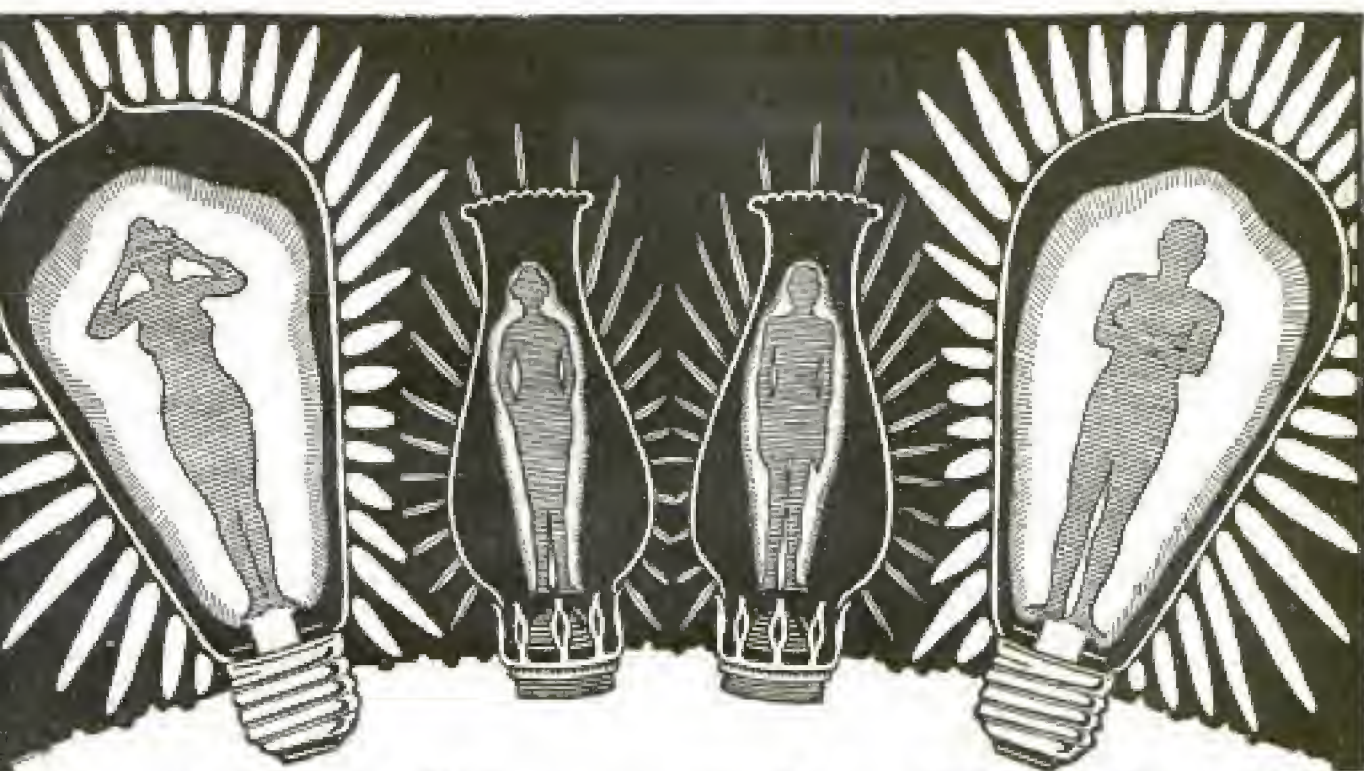
Of course, now that you know the facts you yourself can understand why this new invention is going over like wildfire! And you can understand why F. W. Bentley made \$215 in one day. Why J. Carnegie made \$1,000 in one month and why hundreds of other agents are cleaning up big too.

Oliver Oil-Gas Burner and Machine Co. 2014-N Pine Street, St. Louis, Mo.

Please send me full facts about how I can make at least \$5,000 a year representing you in my territory. Also your plan if I just wish to make big money in my spare time.

Name.....

Address.....



Do You Glow With Health?

Build Up Personality, Magnetism, Vitality with

VI-REX VIOLET RAYS

Some people are dull, drab, uninteresting and sickly! Others are vital, compelling and magnetic! WHICH ARE YOU? It is all a matter of vitality and health. The greatest discovery in years is that of VIOLET RAYS, electricity in a curative, medical form. Violet Rays put new life into over-taxed and sluggish tissues; penetrate and invigorate all the muscles and nerves of the body; give new tone and vitality to the entire body.

Learn the Secret of Physical Perfection

Learn how you can multiply your energy and vim! Learn how to banish those pains, aches, and ailments that run down your system, drain your personality and ruin your looks. WHAT IS PHYSICAL MAGNETISM? It is PERFECT HEALTH—plus the keen mentality based on perfectly balanced nerve centers. We will be glad to send you on request the most interesting book ever published on this subject.

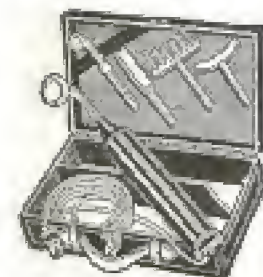
Treat Yourself at Home for Asthma, Constipation, Headache, Rheumatism, Neuritis, Neuralgia, Catarrh, Pimples, Blackheads, Dandruff, Goitre, Pains, Skin Diseases.

Write Now for Startling Book and Free Trial Offer

Just write postal or mail coupon for wonderful free 52-page book explaining in detail. Read how Violet Rays massage every cell in the body. Read letters from users. See what physicians, sanatoriums, home-users say.

Why suffer? Why be satisfied with less than your full share of health and beauty? See what wonderful Violet Rays will do for you.

Mail coupon or write postal for free book and 10 days Trial Offer. Do not miss this offer. Address NOW



VI-REX ELECTRIC CO.

Dept. 22, 326 W. Madison Street, Chicago, Ill.

For New York City ONLY: 47 W. 34th St., New York

VI-REX ELECTRIC CO.

Dept. 22

326 W. Madison St., Chicago, Ill.

Please send me your free book and particulars of your Trial Offer of the Vi-Rex Violet Ray Machine.

Name

Address

City State

**GENUINE****ELGINS** **\$2.00**
A MONTH**WORLD'S LOWEST PRICES****Again—Elgins Lead the World!**

This Fine New Thin Model 12 or 16 Size Genuine Elgin, Complete in 20 Year Gold-Filled Case, plain or engraved—A regular \$20 value. Special this month only.

AT LAST! A Real Watch**At A New Low Price.**

You know the Elgin reputation—it is the watch nine out of every ten men want! Now, you can own one at our astoundingly low price and on such easy terms you'll never miss the money.

Send No Money!

Just name and address will bring full particulars of this remarkable offer and our Free Catalog. No interest, no red tape, A great watch bargain for you if you act now.

HARRIS-GOAR CO., Dept. 361, Kansas City, Mo.

DURING THIS SALE customers living in the several Cities where we have Branch stores will be given This Special Price.

14.95**Sent on 30 Days****Free Trial** You take no risk — we'll

trust you—you have 30 days in which to inspect and compare this handsome watch. Your decision is final—if you do not wish to keep it, send it back at our expense.

Just name and address will bring full particulars of this remarkable offer and our Free Catalog. No interest, no red tape, A great watch bargain for you if you act now.

SAVE YOUR BODY

Conserve Your Health and Efficiency First**"I Would Not Part with it for \$10,000"**

So writes an enthusiastic, grateful customer. "Worth more than a farm," says another. In like manner testify over 100,000 people who have worn it.

The Natural Body Brace

Overcomes **WEAKNESS** and **ORGANIC AILMENTS** of **WOMEN AND MEN**. Develops **erect, graceful figure**.

Brings restful relief, comfort, ability to do things, health and strength.

Wear It 30 Days Free at Our Expense

Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects sloping shoulders; develops lungs, chest and bust; relieves backache, curvatures, nervousness, ruptures, constipation, after effects of flu. Comfortable and easy to wear.

Keep Yourself Fit Write today for illustrated booklet, measurement blank, etc., and read our very liberal proposition.

HOWARD C. RASH, Pres. Natural Body Brace Co.
223 Rash Building SALINA, KANSAS

**For Boys and Girls Also**

Be your own Boss Make \$25 to \$100 a week

Let me put you in a pleasant, profitable, independent business of your own.

If you are making less than \$25 a week, I can show you the way to a bigger income at once. By my plan you can build up in a few weeks a profitable business, paying a growing income, in which you'll be your own boss. You can use spare time or all your time, just as you like.

I have put hundreds of men and women on the road to financial success and independence. In all parts of the country you will find my representatives utilizing their spare time to add to their earnings, or, in full time, making more money than they ever did before.

I can do the same thing for you—you don't need any experience. If you've got grit and confidence in yourself, you can make \$25 to \$100 a week in as pleasant an occupation as anybody could wish.

Read below what a few of my representatives are doing:

C. A. Shelton, Missouri, made sales of \$350 last month working two hours a day.

D. F. Shugrue, Mass., sells \$300 worth of goods a month in part time.

Rosenburger, Ill., averages \$370 a month sales in a community of 600 families.

Frank Schoak, New Jersey, writes he sold \$250 worth of Ho-Ro-Co goods in two weeks.

Mrs. Rouse, Georgia, quit school-teaching to sell our products. In two months her sales were over \$300.

Fawling, Massachusetts, writes: "I make \$50 a week and am my own boss."

I will show letters from these representatives to anybody desiring to see them.

With the backing I give you, and the wonderful quality of Ho-Ro-Co Products, all you need is grit and confidence. Repeat orders come easy because our goods satisfy users, every time. H. B. Tenneman of Illinois, says "People call me up—stop me on the street—even write me to bring more goods."

The Quick Selling Ho-Ro-Co Line

Includes household specialties, toilet articles, soaps, remedies, and other necessities required by every family. Our agents make thousands of dollars on our two leaders alone. Ho-Ro-Co Tonic and Ho-Ro-Co Skin and Scalp Soap. You can do the same. Why not start now?



Mail this coupon at once—make your start to success.

M. G. ROTH, Pres.

Ho-Ro-Co Mfg. Co.

Established in 1908

155 Locust St.,

St. Louis, Mo.

Hundreds of men and women make from \$25 to \$100 a week without previous experience in selling.

Experience is not necessary. Very few of my most successful representatives had previous experience. Ho-Ro-Co products are so good, so well-known, that it's no task to sell them. Furthermore, I give you the benefit of my years of experience—I show you how to go about this easy, pleasant work with full confidence in your ability to make money.

Get Free Sample Case

Let me tell you how to get a big, well-filled sample case absolutely free—how to show Ho-Ro-Co products to your friends and acquaintances. Then you'll realize how easily you can double or triple your present income.

If you'll send me the coupon below, I'll give you full particulars.

Write your name and address clearly in ink on the coupon.

Mail coupon at once!

M. G. Roth, President,

Ho-Ro-Co Mfg. Co. 155 Locust St. St. Louis Mo.

Send me without obligation, full particulars of your Ho-Ro-Co representative's plan whereby I can increase my income.

Name

St. & No.
or R. F. D.

City

State

A Home and Income For You in Sunny Florida



Be Independent—Own a Grapefruit and Orange Grove—A Truck or Poultry Farm. Increase Your Income

You Can Start a Grove Today Under Our New Plan

Develop a profit-earning fruit farm without leaving your present position—provide for your future. A small payment now and a few dollars invested each month.

A profit-producing fruit grove is a permanent investment and provides protection against old age.

THE RIGHT LAND IN THE RIGHT LOCATION AT THE RIGHT PRICE

We Have It—Any Size Farm

These splendid lands are suburban to Tampa, the metropolis of South Florida. Here you find the most healthful, the most delightful climate in North America. For Ten years we have been right here helping develop Hillsboro—the banner agricultural County of Florida, and we are still here to serve you and to help you obtain the farm you want, on very easy payments extending over 2 or 3 years' time to suit.

Groves Developed for Non-Residents

If you want to remain in your present position for a few years we can develop a grapefruit and orange grove for you. When you are ready we will clear your land, furnish fruit trees, plant and care for your grove until you are ready to look after it.

We Raise Our Own Guaranteed Citrus Trees in Our Own Nurseries

This insures every purchaser the best fruit trees that can be grown. This also insures a successful grove. We can save you money on planting and caring for your grove.

\$300.00 to \$500.00 Per Acre Profit

This is not an unusual return for truck farmers in the Famous Tampa district. All kinds of vegetables can be grown. Big prices are paid for early potatoes, winter cabbage, Bermuda onions, tomatoes, celery and dozens of other vegetables during the winter and early spring, when the north is covered with ice and snow. Strawberries, Melons, and other small fruits also yield large profits.

Write for Facts About Sunny Florida

IT COSTS YOU NOTHING TO LET US PROVE TO YOU that we have the land you want—in the location you want—at a price you can afford to pay and on the easiest terms you can imagine. Let us show you.

Fill out and mail us the coupon today and receive our large descriptive book FREE!

NORTH TAMPA LAND CO.

Suite 524 Monon Bldg.

CHICAGO

Coupon for FREE Book on Florida

NORTH TAMPA LAND CO.

Suite 524 Monon Bldg., CHICAGO

Please send me your large illustrated book "The Call of the Southland" on choice Citrus Fruit and Truck Farms suburban to Tampa, Florida, and information on how I can have a grove developed on the monthly payment plan. P.M. 2-22

Name.....

St. No.....

City.....

State.....



Made in Our Own
Great Factories

Yours for 20c a Day

That's just our offer on this cozy, roomy, handsome, inviting, overstuffed, tapestry-covered Rocker. Chair and Sofa to match if you wish. Also 1227 other desirable Furnishings. All on easy, monthly payments. Just check first square below for our big FREE 128 Page Book, showing Furnishings in colors for every room.

- ☐ Furnishings
- ☐ Symphonic Pianos
- ☐ Symphonic Player Pianos
- ☐ Symphonolas

(Check offer interested in)

Symphonic Pianos, Symphonic Player Pianos and Symphonolas (the phonograph with natural tone which plays all Records) sold to tens of thousands of music lovers the past nine years. Get Book describing these musical instruments by checking above.

No Money Down—30 Days FREE Trial 1 to 4 Years TIME

Check offer now. Cut out this ad. Give full name and address. Mail today.

Larkin Co. Inc.

Desk FPM-222

Buffalo, N. Y.



TWO GREAT FUN MAKERS

The dog head is made of metal, with rubber bulb. When you squeeze bulb the dog barks and it's a wiser dog that can tell the difference from the real thing. The cat is worked the same way, only the sound is produced by 4 bellows within each. This cat's meow will fool any cat or your friends. Both are small enough to be concealed in the pocket. Thousands of these have been sold in Chicago.

The Two Sent Postpaid For Only 25 Cents
The Flaming Co., Dept. 30, 3832 Ellis Av., Chicago, Ill.

Only \$19.95

10 DOWN

A YEAR TO PAY

30 DAYS' TRIAL

3 YEAR GUARANTEE

Get your **Kirstin** now!

Take a whole year to pay in small monthly payments. Earn as you pay by being our Demonstrator. Clear your land! Increase your income! Make your tax-eating stump fields pay big profits.

Kirstin One Man STUMP FULLER

Weights less—costs less. Greater power, speed, strength. A few pounds pull on the lever means tons on the stump. You can pull big stumps alone—quick, easy, cheap—without extra help. 32-page illustrated book—**Land Clearers' Guide**—free. Tells best clearing methods under all conditions. Low prices to demonstrators on one-man and horse-power pullers. Write today.

A. J. Kirstin Co., 3204 1st St., Escanaba, Mich.

AUTOMOBILE ENGINEERS - REPAIRMEN CHAUFFEURS - GARAGE OWNERS - TRACTOR EXPERTS **NEEDED NOW AS NEVER BEFORE**

*Reduced
in Price
for
YOUR
BENEFIT*



*They
Lead the
Way to a
BIG PAY
JOB*

Use these pay raising books a week FREE

Everything You Need to Know About Autos!

Automobile motors; welding; motor construction and repair; carburetors and settings; valves, cooling; lubrication; fly wheels; clutch; transmission; final drive; steering frames; tires; vulcanizing; ignition; starting and lighting systems; shop hints; commercial garages; design and equipment; electricity; storage batteries; care and repair; motorcycles; commercial trucks and tractors.

Get ready for a big pay job. Investigate this great bargain offer on our popular six-volume set of Automobile Engineering! We have already sold over 75,000 sets of these books to help young men forge ahead into the big pay class—a fact that allows us, because of lowered cost of production, to sell these great books at only \$24.80—regular price \$45.00!

Learn at Home—In Your Spare Time

You can learn at home—in your spare time—all you need to know to make you an expert auto authority. Don't let an opportunity like this go by—mail the coupon today and the books will be sent by express collect—for your careful examination—right in your own home.

DON'T SEND A PENNY NOW

Just the coupon. You get the books for FREE examination. Then at the end of the week, either send the books back to us without a penny's cost to you, or send \$2.80 to show that you want to advance to a big job with big pay.

ONLY A DIME A DAY

is all you have to pay—\$3.00 a month until our special reduced price of \$24.80 is paid. Don't delay a day. If you will fill in and mail the coupon NOW, we will include with the set of books, membership in the Society.

Free Consulting Service

This membership entitles you to consult our staff of experts on any problem or question that may confront you—their advice is free to you! (Regular price, \$12.00.) Mail the coupon now before the limited membership is filled.

American Technical Society
Dept. A-A-192, Chicago, U. S. A.

AMERICAN TECHNICAL SOCIETY
Dept. A-A-192, Chicago, U. S. A.

Send me a set of Automobile Engineering for 7 days' FREE examination by express collect. Within one week after the books arrive I will either return them at your expense or send you \$2.80 as first payment and \$3.00 each month until the special reduced price of \$24.80 is paid. With the books I am to receive Free a consulting membership in your society.

Name

Address

Reference

Please fill out all lines

Build a New Body



**Treat Yourself
at Home For—**

**Nervousness
Neuralgia
Rheumatism
Sciatica
Headaches
Anaemia
Insomnia
Brain-fag
Neuritis
Paralysis
Lumbago
Inflammations**

Any nervous disorder or painful Chronic Disease.

Rid Yourself of Weakness, Pain and Disease

Just as sunshine purifies the air and strengthens every living thing, Violet Ray treatment will purify your blood, strengthen and stimulate your body, drive out aches and pains and give you the steady nerves and vitality necessary for success. One treatment in your own home will prove this without risk to you. Our free "Health Book" tells how this wonderful treatment increases the number of red corpuscles and the oxygen content of the blood, and how it saturates the body with life-laden health-building energy.

Renulife Violet Ray High Frequency

—possesses the wonderful power of bringing a vigorous surge of rich, fresh blood to any weak, diseased or painful part of the body. Congestion is relieved, poisons are washed away, the part is warmed and soothed and the new blood carries away the diseased cells and replaces them with healthy, new nerve and muscle tissue. It literally builds new bodies. If your body is thin and undeveloped, if you lack nerve force and vitality, if you suffer from insomnia and brain-fag and if you want immediate relief, you should

Send For Free "HEALTH" BOOK NOW

It has pointed the way to health and success for thousands. It has shown them how to acquire "driving power" for their daily work, and calm nerves that permit sound sleep at night. It has enabled them to cure painful chronic diseases such as rheumatism, headaches, neuritis, etc. More than 100 disorders and weaknesses are successfully treated. It is not a "cure-all," but no matter what your trouble is, our Free Book will tell you whether or not you can be benefited.



Stimulates, invigorates and develops weak bodies

Renulife Electric Co.

1102 Newberry Bldg.

Detroit, Mich.

In Canada: Nations Bldg., Windsor, Ont.

—MAIL THIS COUPON—

Renulife Electric Co.

1102 Newberry Bldg., Detroit, Mich.

Please send me your Free "Health" book, telling of the benefits derived from Renulife Violet Ray Treatment in a hundred disorders and weaknesses.

Name

Address

City

State

Sales Agents: Investigate our attractive contract.

Crippled 33 years



Although deformed 33 years from Infantile Paralysis, F. L. Kelsey, age 35, now "walks straight and flat" after only 5 months' treatment at McLain Sanitarium. See his photos. Read his letter. Write him.

After being crippled for thirty-three years, by Infantile Paralysis, and walking on my toes for all that time, I am now walking straight and flat on both feet, after taking only five months' treatment at your Sanitarium. I will be only too glad to recommend it to any one who is crippled, for I know you can do the work.

F. L. KELSEY,

Box 1507, Tusupah, Nevada

For Crippled Children

The McLain Sanitarium is a thoroughly equipped private institution devoted exclusively to the treatment of Club Feet, Infantile Paralysis, Spinal Diseases and Deformities. Wry Neck, Hip Disease, Diseases of the Joints, especially as found in children and young adults. Our book, "Deformities and Paralysis," also "Bank of References" sent free.

L. C. McLAIN ORTHOPEDIC SANITARIUM

302 Aubert Ave., St. Louis, Mo.

St. 4436

PANDICULATE FOR HEALTH



**BE WELL
YOUNG
STRONG**

Booklet Free

Fifteen glorious minutes on Pandicator better than two hours in gymnasium. Refreshes, rejuvenates; frees impinged, irritated nerves; corrects contracted muscles, spine ligaments; relieves congestion, improves circulation and body drainage. Doctors recommend it. No electricity, no discomfort; delightfully restful. Write now

PANDICULATOR COMPANY

Dent. E, 2607 Prospect Ave.,

Cleveland, Ohio

Nobody Wants A Miserable Misfit



At first they pity him—then they have contempt for him—then they avoid him—and finally they throw him overboard and leave him to his doom. How about you? Are you a weakling without sufficient pep and courage to be a real man and do a man's work in this world? Are you a complaining misfit loaded with ailments such as Catarrh, Gonorrhea, Nervousness, Indigestion, Hypertrophy, Weak Heart, Lung Trouble, etc., and crippled with Rupture, Rheumatism, Round Shoulders, Flat Chest and Flat Feet, Vital Depletion and the other defects that come from neglect of the body and disregard of the natural laws of health. Come—wake up—make yourself a 100% Man! I want to help you—I can help you.

STRONGFORTISM—The Modern Science of Health Promotion will banish your ailments, revive your vital powers and fit you for the joys of life. Registering 10.

Register for ailments in which you want special confidential information, and send word to be sent by mail, not by mail, to the Free Book, "Promotion and Conservation of Health, Strength and Mental Energy. Send for it RIGHT NOW—TODAY."

LIONEL STRONGFORT

Physician and Health Specialist

Dept. 655

Newark, New Jersey

Big Salaries for Executive Accountants

Business needs more Business Architects!

Not carpenters of business, mind you, bookkeepers who merely do the detail work, but trained accountants, who can go behind the figures of the bookkeeper, determine costs to the fraction of a penny, lay finger on unprofitable departments, point the way to greater profits.

Never have the services of the executive accountant been so vital to the success of business enterprises—or so well rewarded. Salaries of \$10,000 and better are not uncommon. Many heads of successful accounting firms make from \$25,000 to \$50,000 a year.

**Set Your Mark At
\$5,000 to \$10,000 a Year**

Why not find out what you must do to qualify in this attractive and profitable profession?

During the next few years hundreds of men will be advanced to private offices of their own, and on the glass will appear titles such as these: General Auditor—Specialist in Income Tax—Cost Accountant—Comptroller—Treasurer—Certified Public Accountant.

The majority of these men, at the present time, have their desks with the bookkeepers and clerks. Today they have no better start than you, but they have fixed their aim on a definite goal—they have resolved to command an income of from \$5,000 to \$10,000 a year. And they will get there! They will make their spare time count during coming months—and by home-study training they will win their way to high-salaried positions.

Train by the "Problem Method"

Begin today to reckon yourself among the men who will swing these big-pay jobs. Train at home, by the LaSalle Problem Method; equip yourself in the most practical way known to educational science, for swift advancement.

Under the LaSalle plan of training you will get the benefit of the combined experience of hundreds of authorities; you will solve the very problems which the professional accountant solves for our greatest business organizations; you will handle every practical situation in every phase of accounting work, and will have the personal direction by mail of prominent members of the Accounting profession, who will see that every question is answered, every point made clear on business analysis, organization, general accounting, cost accounting, auditing, commercial law, and income tax.

The result of such training is that when you step into that bigger job you will find yourself at home in it from the very beginning—because you will have mastered, under the direction of practical business men, the problems of your new position.

All this counts toward the swiftness of a man's promotion; it explains, in part, how L. S. Railsback, for example, won a salary raise of 288 per cent, how H. E. Brown won an increase of 200 per cent, and how John J. Decker was enabled to make ten times the cost of his course within six months of his enrollment.



It also helps to explain why as many as 1,089 LaSalle members, in a period of only three months, reported salary-increases resulting from training under the LaSalle Problem Method totaling \$849,713, an average increase per man of 56 per cent.

Mail the Coupon

Find out today about this training—learn how you can get it in the quiet of your own home, without losing an hour from work or a dollar of pay—see if it is not just what you need to increase your earning power. The coupon, mailed today, will bring you all the facts, together with particulars of our convenient-payment plan; also your free copy of the inspiring book, "Ten Years' Promotion in One." It places no obligation on you and it brings you—opportunity. Mail the coupon NOW.

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Please send me catalog and full information regarding the course and service I have marked with an X below. Also a copy of your book, "Ten Years' Promotion in One."

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Training for positions as Auditors, Comptrollers, Certified Public Accountants, Cost Accountants, etc.

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| <input type="checkbox"/> Business Management | <input type="checkbox"/> Banking and Finance |
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A new line of high grade Starrett dividers selling at a moderate price. These dividers are fitted with an improved firm joint and will be found very rigid. The points are hardened and the dividers are well finished throughout. Described and illustrated on page 277 of the new Starrett Catalog No. 22 "AP." Copy of this catalog sent free on request, also Special Supplement showing new Starrett Tools.

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WITTE

2 H-P Engine

\$39.95 F.O.B. K.C.

From Pittsburgh, 45 More.

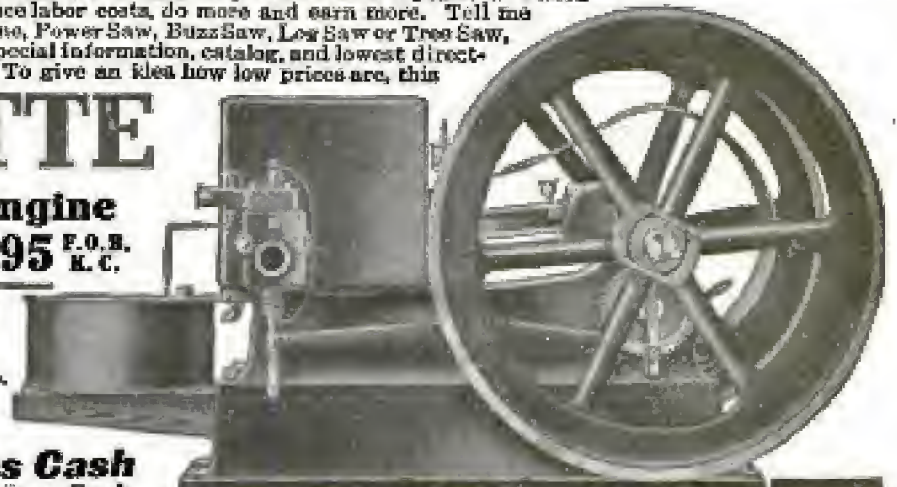
Here is a chance to get your power plant, any size, up to 30 H-P., at a big saving. I can make immediate shipment, guarantee safe delivery. Engine shown is shipped on skids, ready to operate. Easy to set and use. Easy to buy now.

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Guarantee All WITTE Engines, Saw Outfits, Log and Tree Saws sold on 90-Day Test and Life Guarantee against defects.



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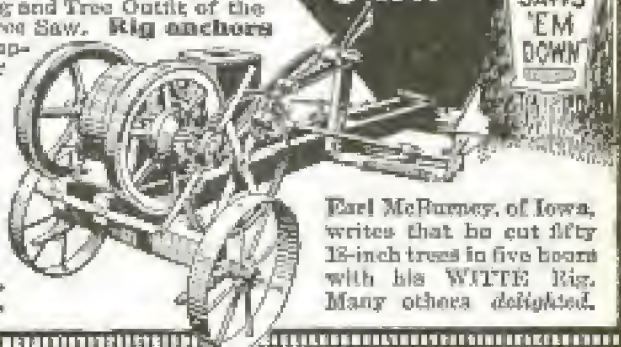
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From Log
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100% white diamond in this ring. Try to match at 60 per cent more. Clear, loan \$50. Same style, various sizes, see Bargain List.



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Blue white diamond mounted in an earring. Try to match at \$400. Clear, loan \$100. Same ring, \$50 to \$100 in other weights. See the Bargain List.



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\$388
1 1/4 less 1/16 Ct.
Blue white diamond. White gold ring with marquise. Try to match at 60 per cent more. Guaranteed loan \$250. Page 29 in Bargain List.



\$350
100% white, perfectly cut diamond in genuine platinum diamond-studded ring. Other diamonds in platinum mountings, \$100 to \$1200. Also magnificent mountings in 18 kt. Solid white gold. The exact replica of platinum. See latest Bargain List.



\$75
1 1/3 Ct. Size
Diamond Cluster Ring. Platinum. Try to match at \$100.
Other clusters from \$20 to \$200. Pages 10, 11 and 22 in latest Bargain List.



\$48
1 Ct. Show.
Solid white diamonds. Try to match at \$100.
Plain styles, \$20 to \$150, shown in Bargain List.

\$57
3/8-1/16 Ct.
Blue white, perfectly cut diamond. Set in white gold ring. Try to match at \$120. Clear, loan \$15. Various size diamonds in this mounting. See Bargain List.

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Now service FREE to you. World renowned diamond authorities will value your diamond for you. We backed his judgment of diamond value by actual cash advances to him and other deals in excess of \$20,000,000.00. Write for details.

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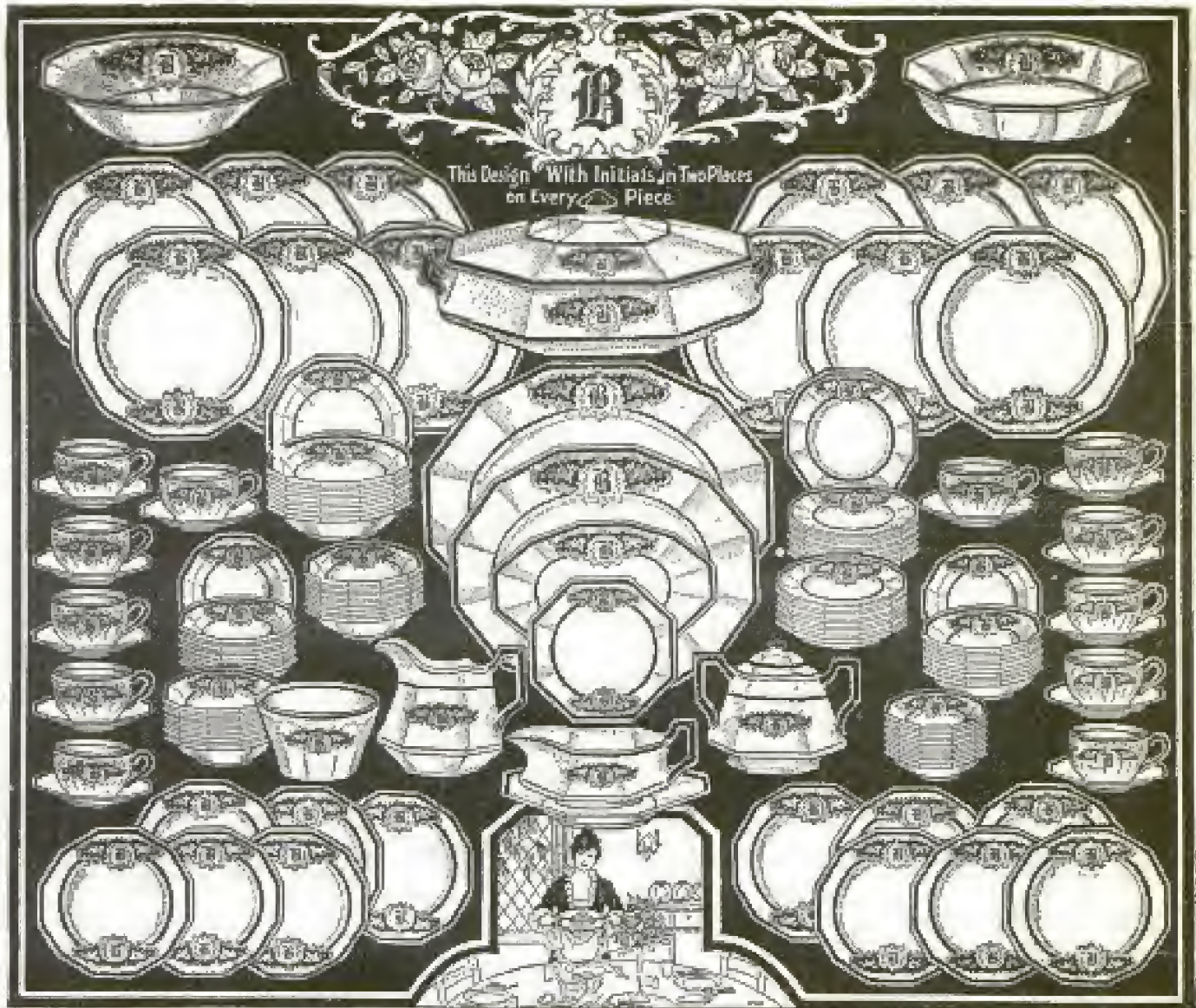
Diamonds bought here are like insurance policies. You know what you can borrow before you decide to buy—see Our Cash Back Guarantee

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This Superb 110-piece Set, with initial in 2 places in wreath with 5-color decorations on every piece and gold covered handles, consists of:
 12 Dinner Plates, 9 inches
 12 Breakfast Plates, 7 inches
 12 Cups
 12 Saucers

12 Soup Plates, 7 1/4 inches
 12 Cereal Dishes, 6 inches
 12 Fruit Dishes, 6 1/4 inches
 12 Individual Bread and Butter Plates, 6 1/4 inches
 1 Platter, 13 3/4 inches

1 Platter, 11 3/4 inches
 1 Celery Dish, 8 1/4 inches
 1 Sauce Boat Tray, 7 1/4 inches
 1 Butter Plate, 6 inches
 1 Vegetable Dish, 10 1/2 inches, with lid (2 pieces)

1 Deep Bowl, 6 1/4 inches
 1 Oval Baker, 9 inches
 1 Small Deep Bowl, 5 inches
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 1 Creamer
 1 Sugar Bowl with cover (2 pieces)

Brings 110-Piece Gold Decorated Martha Washington Dinner Set

Send only \$1 and we ship the full set—110 pieces. Use it 30 days. Then if not satisfied, return them and we refund your \$1 and pay transportation charges both ways. If you keep them, take nearly a year to pay on easy terms.

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Wonderful artistic effect is given by the wreath and rich design surrounding the initial. Your initial appears in 2 places on every piece.

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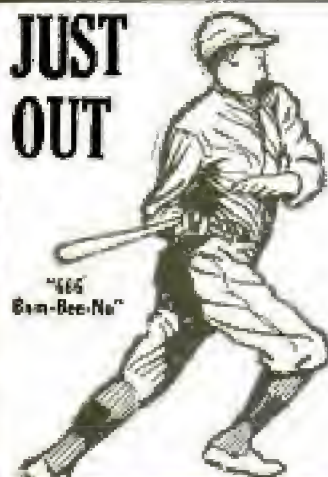
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Bam-Bee-No

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Real baseball played on any table, anywhere. Everybody going wild about it. All the interest of an actual ball game without delays, discomfort or inconvenience. Excitement! Wow! Oh, Man! Nothing else like it. Just the thing for these times. You'll have a thousand dollars' worth of enjoyment every evening.

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Be first in your neighborhood. Give a "Bam-Bee-No" party and see what a hit you make. (This is not a game for little children.)

"Bam-Bee-No," The National Game, complete with playing field, nine men, three counters, three "combination cubes" and original copy-righted book containing easy-to-learn rules and **every play known to baseball**—all in handsome box with full directions for use. \$1.50 postpaid (Canada \$2.00.) Money back if not satisfied. **Descriptive folder free.**

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Babe Ruth says: "I have seen the baseball game which you have copied out and certainly think you have hit on a popular idea." Sport writers all say it's a "Win." Joe Villa, Sport Editor of the New York Sun, says: "I've played your baseball game and found it one of the most interesting novelties I've ever seen."

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Buy a Bam-Bee-No outfit today. Have a game with the family or choose up sides with your friends. Play every day for three days. If you're not satisfied at the end of the third day, return the outfit and we'll refund your \$1.50. Descriptive folder free.

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Also other sailboats, power
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Complete
Partly finished
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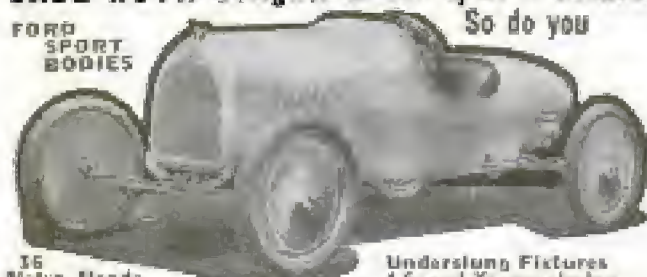
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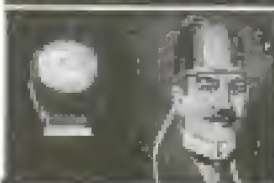
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"Electrical Experts" earn \$70 to \$200 a week. Fit yourself for one of these big paying positions.

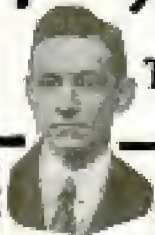
Don't plug along year after year—get the Big Money now—I will make you an Electrical Expert.



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Dear Mr. Cooke:
I have not been sending in any letters lately on account of being very busy in my business. Am now working 7 Electricians, paying each of them \$1.00 a day above the Union scale. I have a hand now, unfinished, over \$12,000 worth of contracts for electrical work, and am now making arrangements to have a nice three building, 50x100 ft., put up for my shop and store.

Not so bad for a student who is practically a new beginner one who had to borrow \$5 for his first payment on your course and who started in business with just 67¢ to his name. In addition to building up a nice little business I have built a little home, in which I owe less than one thousand dollars.

Things are moving early now, and I expect soon to get back to my lessons and complete your wonderful course. Sincerely yours,
A. T. THOMPSON.

TODAY even the ordinary electrician—the "screw driver" kind—is making money—big money. But it's the trained man—the man who knows the whys and wherefores of Electricity—the "Electrical Expert"—who is picked out to "boss" ordinary electricians—to boss Big Jobs—the jobs that pay.

I Give You a Real Training

As Chief Engineer of the Chicago Engineering Works I know exactly the kind of training a man needs to get the best positions at the highest salaries. Hundreds of my students are now earning \$3,500 to \$10,000. Many are now successful ELECTRICAL CONTRACTORS. Read the letter at left, sent me by A. T. Thompson. I have several thousand of such letters on file.

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I give each of my students a splendid outfit of fine electrical tools, materials, instruments, etc., absolutely FREE. You do practical work at home, right from the start. These tools will help you pay for your course in picking up spare-time money. Many of my students do this.

I want to send you my Electrical Book, "Vital Facts," and

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So sure am I that you can learn Electricity—so sure am I that after studying with me, you, too, can get into the "big money" class in electrical work, that I will guarantee under Bond to return every single penny paid me in tuition if, when you have finished my course you are not satisfied it was the best investment you ever made.

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Chicago Engineering Works, Dept. 512,
2150 Lawrence Ave.,
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Dear Sir: Send at once Sample Lessons, your Big Book, "Vital Facts," and full particulars of your Free Outfit and Home Study Course—all fully prepaid, without obligation on my part.

Name.....

Address.....

The Cooke trained man is the "Big-Pay" man

Motor Secrets That Quickly Put Me On Easy Street

By O. H. Justus

Not so very long ago it looked like I might plod along in the wage rut all my life.

Today I'm living on "Easy Street," and when friends look over my property they say: "Justus, you've been lucky!"

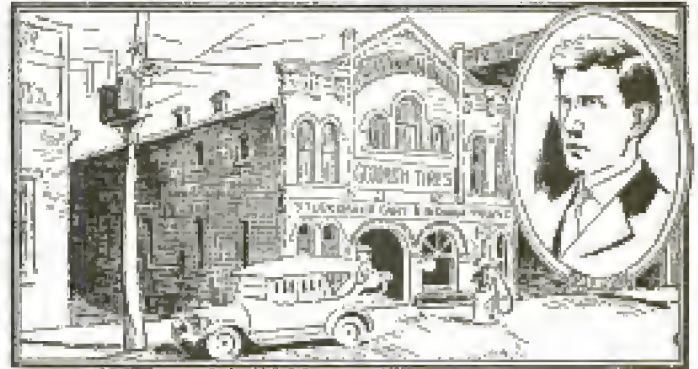
They see a big, busy auto repair shop, new stocks of tires, cars and trucks and scores of cars and customers coming and going. And they wonder how a wage earner could have got hold of such a business.

Well, I didn't do it by "luck," brilliance or somebody else's money. I did it by simply **using** the common sense every man has. And **any** man who wants to can do as well or better.

First, I made up my mind to **TRY**. Then I saw that the greatest demand for men, best pay and surest future were in keeping our millions of cars, trucks and tractors in repair. But I soon found out that becoming a mechanic by the old "experience" system meant several more years of the grind. I also saw that the men who had learned that way were not getting anywhere, while the good jobs and big money were going to men with special training—men who knew the mechanical secrets of motors. "I don't want to be a grease hound or a second-rate wrench twister," I said to myself. **"I'm going to learn these secrets, too."**

Henry J. Rahe made it possible. Remember his name, because he can do the same for YOU. I read an advertisement about his quick, easy practical course in auto and tractor work in his big shop-schools—**learning with tools, not books**, and from master instructors under Mr. Rahe's personal supervision. Largely out of curiosity, I mailed "the coupon in the corner." And it turned out to be my ticket to "Easy Street."

A few days later I was on my way to one of the Rahe Schools



O. H. Justus and his big agency and repair shops at Parkersburg, W. Va.

which I consider the **ONLY** schools. A few weeks later I was back home, a Rahe graduate—master of all the motor secrets that separate the \$2-a-day laborer from the \$40 to \$100 a week of the **real mechanic**. Easy Rahe training had made me a **free man** for less money than a good Rahe-trained mechanic earns in **three weeks**.

Since then I've never wanted for work an hour. My big pay as a mechanic soon enabled me to open my own shop, which **ALWAYS** has had from a week's to a month's work ahead of it. No job ever has "stuck" me; none of my work has "fallen down." I have employed mechanics who had just "picked up" the trade—almost invariably to my sorrow. But I've never hired a Rahe-trained man who didn't make good. The only trouble was, I couldn't keep them—they **all went into business for themselves**. And, so far as I know, every one of them is now on "Easy Street."

If you want to get somewhere, be your own boss and make some real money, find one of these "coupons in the corner" and send it to Henry Rahe **today**. Then, if you use your wits, it will prove to be your ticket to "Easy Street," too. I'm giving it to you straight. I **KNOW**.

I Want Men! I'll Pay Your Fare to Chicago, Cincinnati or Kansas City

I want to help 500 ambitious men follow Justus to "Easy Street" in the next few months. **YOU**—regardless of your age or education—can get there easier than he did. Today the field is bigger, the demand for Rahe-trained men greater and the pay better. And you can get to my school nearest your home **FREE OF CHARGE!** I'll pay your railroad fare in full to my nearest school, no matter where you live. It's going to be a **BIG** year for Rahe-trained men. Get started **early!** Just jump on a train for the nearest Rahe school. Every cent of your fare will be refunded the minute you enroll. (Read my 7-day guarantee.)

Master Instructors Wonderful Shops

Every instructor in my three schools is a **MASTER** of his business—trained by me and always under my direction. I keep constantly in touch with each school and see that things are done **RIGHT**. The Rahe shops are really wonderful. They contain **everything** needed to make **YOU**, too, a **MASTER** of this big-money business.

You don't need "book learning" to succeed in this business—just a few weeks' pleasant training on actual motors and cars. If you don't want to go into business for yourself, you can make **REAL MONEY** working for others. **Bill Peace**, one of my graduates, writes me that he's making \$250 a month and expenses operating a tractor in the



I've put 40,000 men on "Easy Street." I can and **WILL** do it for you if you'll simply tell me you want to go. Say it **right now**.

HENRY J. RAHE.

all fields. **THOUSANDS** of Rahe-trained men make reports like this.

Special Money-Saving Price

I've always given as good a course and at as low a price as that made by any reliable school, bar none. Now, with schools in three locations—getting nearer to my prospective students and increasing my capacity—I can reduce my prices still further—and **pay your railroad fare besides!** Get my low tuition figures. You'll be pleasantly surprised.

7-Day Guarantee

Try a Rahe School a week. Then, if you don't like it—if you don't believe my methods will make you a competent auto and tractor mechanic—you can withdraw and the 7 days' training will cost you **NOTHING**. No other school offers this guarantee. It's your **INSURANCE** of satisfaction. Don't forget—this will be a **BIG** year for Rahe-trained motor-maintenance engineers—thousands will be needed. Get started **QUICK!** Send the coupon or a post card and find out about the **EASY** Rahe way to "Easy Street."

Do it today.

Yours for quick success,

Henry J. Rahe

It Costs You Nothing to Get the PROOF

The coupon will bring my big free book, with proof that Rahe training will start you to "Easy Street." No cost—no obligation. Write me **NOW**.

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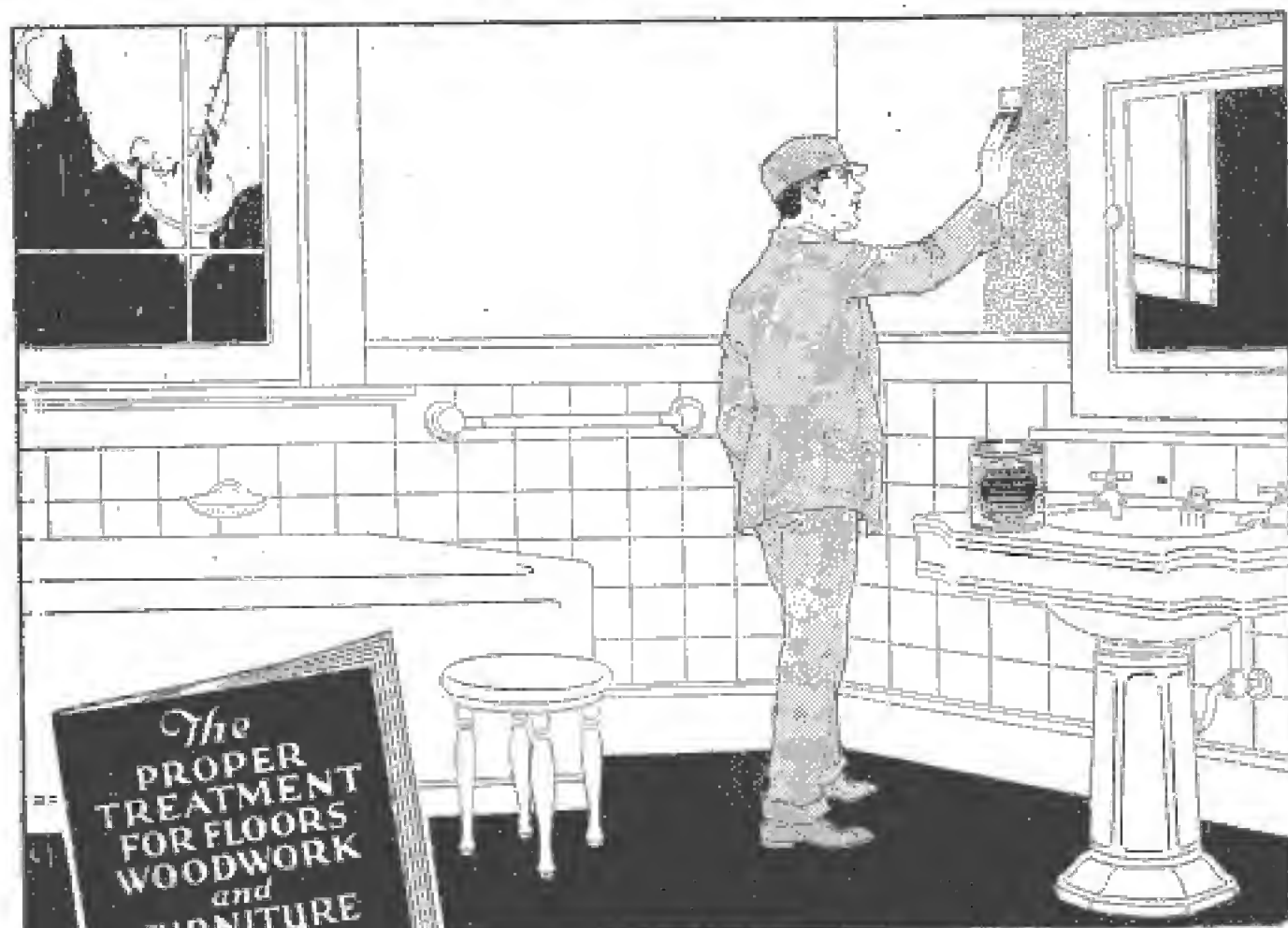
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Town.....State.....

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two after my bowl,
They're always Lifesavers
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